U.S. Department
of Transportation

Operator Availability Management Methods

June 1984

UMTA TECHNICAL ASSISTANCE PROGRAM

Operator Availability Management Methods

Final Report
June 1984

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I. INTRODUCTION

Operator availability management is the collection of techniques, procedures, and information used to maintain cost-effective transit operator staffing levels. It is but one component of labor management. Whereas labor management addresses all elements affecting labor productivity -- work rules, absenteeism, and scheduling, for example -- operator availability management addresses only the mechanics of matching operator supply with demand. It can be analogically described analysis to an inventory problem. As with an inventory, the objective is to keep manpower supply in balance with demand (i.e., work to be filled). An imbalance in either direction incurs additional cost.

The effective management of operator availability is of growing concern. As transit managers seek ways to increase productivity, operator staffing levels will become an area of investigation simply due to their contribution toward operating expenses. The task of achieving and maintaining a cost-effective driver inventory is, however, a complex one. It cuts across organizational lines and demands effective planning, coordination, and control.

This report describes procedures and techniques applied in managing operator availability. While all transit systems must necessarily have some approach to this task, it is not uncommon for manpower availability management to be unstructured and somewhat enigmatic, even to those persons who may be

direct participants in the process. A fundamental objective of this report is to promote a greater understanding of the dynamics of operator availability management, chiefly through describing techniques employed by three U.S. transit systems. These systems were selected for study because they have each realized benefits from designing and implementing structured approaches to improving operator availability.

The remainder of this report is organized as follows:

- An overview of operator availability management;
- Seattle Metro Case Study;
- Metropolitan Transit Commission (Twin Cities) Case Study;
- Capital District Transportation Authority (Albany, New York) Case Study; and
- Summary and recommendations.

Although the intent of this report is to communicate alternatives in planning and control, some technical aids discovered in the course of the study are briefly documented in the Appendix.

II. AN OVERVIEW OF OPERATOR AVAILABILITY MANAGEMENT

A basic objective in managing operator availability is to minimize cost while meeting service effectiveness goals. While these two endeavors are easily measured when separately considered, their interplay is much more difficult to establish. Transit agencies, typically under the public gun for meeting scheduled service, often rely on a safe cushion of operators so that service effectiveness is maximized. The cost-effectiveness of this cushion, however, is open to debate. In an era of fiscal constraint, it is increasingly important that operators be productively utilized.

While the potential savings from improved operator availability is difficult to estimate, the need for managerial controls can easily be established. The traditional management functions of planning, organizing, directing, and coordinating cannot be accomplished if controls are not in place. There are basically two types of controls which are required:

- Informational - the collection and abstraction of data for management purposes; and
- Organizational - the coordination of different functions reporting to different managers.

The complications which often arise in designing controls so necessary to operator availability management are discussed below.

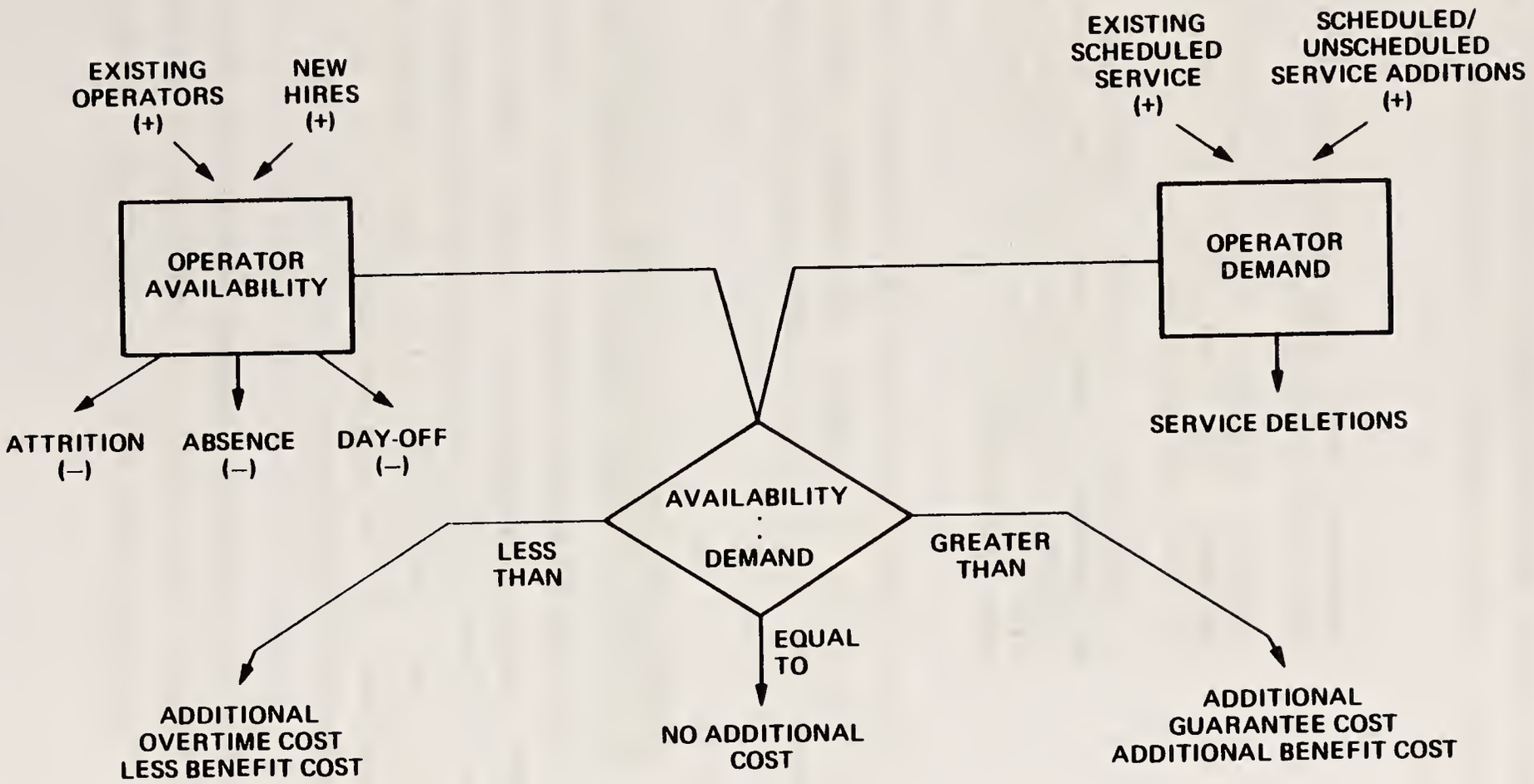
1. Operator Availability Management Is Made Complex By A Number Of Interrelated Variables

The variables which affect how many operators are available for work and how much work is to be performed are the basic data needed for managing the problem. As mentioned earlier, operator availability management is akin to matching inventory to a production schedule. When inventory matches production needs, no unplanned costs are incurred. When inventory exceeds or falls below production needs, additional expenses result. Cost penalties, for instance, like those resulting from emergency purchasing, occur when too few operators are available for the work to be performed. Thus, management must constantly monitor the data contributing to the supply, or inventory function, and the production function as well.

For any point in time, the efficiency of operator availability management can be evaluated by comparing availability with demand, as shown in Exhibit II-1. This simple abstraction indicates three possible results -- manpower can be less than, equal to, or greater than demand. Each result carries with it a cost. The question is which result costs least and is also operationally feasible.

The real problem is more difficult than this simple abstraction. In reality, the comparison of operator availability to demand, and the resulting cost, must be evaluated over many points in time. Each of the variables in Exhibit II-1 are subject to change, sometimes on a daily basis (e.g., absences). As a result, a given manpower level may provide surplus operator availability on one day and a deficit on the next. Additionally, some variables, such as sick leave rates, also vary with operator availability relative to demand (e.g., decreasing when at a surplus).

EXHIBIT II-1
BASIC VARIABLES AFFECTING MANPOWER LEVELING DECISIONS



Management must have oversight of these variables and understand their interrelationships in order to more intelligently make manpower planning decisions. When this full integration is not achieved, one of several situations typically results:

- Manpower levels are inflated to meet near-maximum open run situations.
- Control systems (e.g., performance measurement systems) are inadequate in communicating whether any cost problems exist.
- A preferred manpower level is identified and maintained, sometimes based on the relationship between unscheduled pay hours and extraboard size, but typically not inclusive of all costs (e.g., benefits).

In short, foregoing attention to any of the variables affecting the match of supply and demand, especially when service levels are variable, can have substantial cost consequences.

2. Operator Availability Management Cuts Across Organizational Lines, Further Compounding Complexity

For operator availability to be properly managed, interfaces among organizational units must be well structured. Even if fool-proof procedures are in place to monitor manpower levels and optimally define what level is needed, overall management of the problem can fail if channels of communication are not understood.

The key to structuring these interfaces is understanding the nature and timing of information being transferred from one organizational unit to another. Although organizational

structures vary from one place to another, the functions which should be discharged in manpower planning are somewhat constant. Typically, there are six organizational units which have some impact on this process:

- Service planning;
- Scheduling;
- Transportation administration;
- Transportation divisions;
- Transportation instruction; and
- Personnel.

An example of how these functions contribute to operator availability management is shown in Exhibit II-2. As is evident, a considerable amount of information created in one organizational unit must be passed to others for them to discharge their responsibilities. At the strategic level (i.e., exploration of annual service alternatives), an operator work force plan should be established based on communication between service planning and transportation. At the tactical level (such as short-range projections of manpower needs), transportation must establish both inter- and intradepartmental communications. Communication with personnel, for example, is essential whenever the hiring plan is modified and within a timeframe which enables them to react to the change. Finally, at the operational level (e.g., daily driver assignments), driver status should be constantly monitored, and imbalances reported upward.

The following three chapters explain how informational and organizational controls have been developed in Seattle, Minneapolis/St. Paul, and Albany, New York to improve operator availability management.

EXHIBIT II-2
ORGANIZATIONAL RESPONSIBILITIES AND INTERFACES IN MANAGING OPERATOR AVAILABILITY

ORGANIZATIONAL UNIT RESPONSIBILITIES	INFORMATION TRANSFERRED TO					
			TRANSPORTATION			
	SERVICE PLANNING	SCHEDULING	ADMIN.	DIVISIONS	INSTRUCTION	PERSONNEL
1 SERVICE PLANNING						
• ANNUAL SERVICE PLAN		• TIMING, SPAN AND SCOPE OF SERVICE CHANGES				
2 SCHEDULING						
• PERIODIC RUNCUTS			• SCHEDULED DRIVER ASSIGNMENTS			
• INTERIM SERVICE MODIFICATIONS			• IMPACT ON ASSIGNMENTS	• IMPACT ON ASSIGNMENTS (ADDITIONAL, CURTAILED)		• HIRING NEEDS BY DRIVER TYPE, BY MONTH
3 TRANSPORTATION						
1) ADMIN						
• ANNUAL MANPOWER PLAN	• ABILITY TO RESPOND TO SERVICE CHANGES				• HIRING NEEDS BY DRIVER TYPE, BY MONTH	• HIRING NEEDS BY WEEK
• PERIODIC RE DEFINITION OF SCHEDULED MANPOWER NEEDS		• PROJECTED MANPOWER LEVELS AT SHAKE-UP TIME			• HIRING NEEDS BY WEEK • IDENTIFY OTHER TRAINING OPPORTUNITIES (EG PASSENGER RELATIONS)	
• SHAKE-UP ADMINISTRATION				• VACATION SCHEDULES • BID ASSIGNMENTS • OPEN ASSIGNMENTS • EXTRABOARD SIZE • REPORT CREW SIZE • DAYS-OFF FOR ALL OPERATORS		
• WEEKLY COORDINATION				• TRANSFERRING OF OPERATORS	• ALLOCATION OF TRAINEES TO DIVISIONS	• VERIFY SHORT-TERM HIRING NEEDS
• PERFORMANCE MONITORING				• OPERATOR UTILIZATION • SERVICE EFFECTIVENESS	• TRAINEES' PERFORMANCE	• TRAINEES' PERFORMANCE
2 DIVISIONS						
• SHAKE-UP PLANNING			• REPORT CREW NEEDS • EXTRABOARD NEEDS			
• BOARD ASSIGNMENT			• UTILIZATION OF SURPLUS OPERATORS			
• DAILY DISPATCHING			• DAY-OFF OPERATOR USE • ABSENCES • CANCELLATIONS • REPORT CREW UTILIZATION			
• WEEKLY COORDINATION			• HIRING NEEDS • PLAN FOR MEETING SHORT TERM OPERATOR SURPLUS/DEFICIT		• DRIVERS AVAILABLE FOR ADDITIONAL TRAINING	
3 INSTRUCTION						
• WEEKLY COORDINATION			• CAPACITY			• CAPACITY
• TRAIN NEW DRIVERS			• TRAINEE PERFORMANCE AND ATTRITION			• TRAINEE PERFORMANCE AND ATTRITION
• RETRAIN EXISTING DRIVERS			• CERTIFICATION			
4 PERSONNEL						
• WEEKLY COORDINATION			• CAPACITY • INVENTORY OF APPLICANTS • DEFINITION OF LEAD TIME • ACCEPTANCE OF RE-APPLICANTS			

III. SEATTLE METRO CASE STUDY

This chapter describes the procedures and techniques utilized by Seattle Metro Transit in managing operator availability. Metro's system of manpower planning and controls has evolved in response to two stimuli. First, Metro experienced rapid and substantial service growth over the period 1978 to 1981. Coupled with the implementation of a part-time labor agreement -- up to 50 percent of the total driver workforce -- this situation demanded that manpower needs be carefully planned. Metro's extensive use of part-timers is a unique operating characteristic. Second, Metro implemented a management by objectives (i.e., MBO) system in 1978 that fostered the growth of control, or monitoring, systems. Several management objectives for the Base Operations Division (i.e., the transportation function), relate to operator availability -- sick leave, late reports, pay hour to platform hour ratio, report hours (i.e., unproductive use of report crew), and number of minutes of delayed service. These objectives are integrated among three levels of base operations management. Incentives are provided at each level for reaching their objectives; automated and manual reporting systems support measurement of the objectives.

Metro's manpower planning process relies on administrative procedures as well as automated and manual techniques and systems. These procedures, techniques, and systems are presently oriented more toward control than optimization. Efficiency is promoted by tight control over the broader

parameters (e.g., manpower levels), with authority for operational decisions relative to operator management largely delegated to line management. The efficient management of operator availability at each operating base (i.e., division, garage), for instance, is promoted through the MBO system. Metro also continues to develop techniques designed to improve the efficiency of overall parameters as well as support daily operator assignment decisions.

The remainder of this chapter provides some background on events which shaped the existing approach to operator availability management, then describes the content of their program, as follows:

- Manpower Planning Process, which describes the strategic, tactical, and operational activities used by Metro in managing operator availability.
- MBO System, which describes how the Base Operations Division is structured to promote driver performance, and the systems relied upon to support control needs.

Background Events

Seattle Metro's present approach to managing operator availability has been shaped by several major events which prompted the development of structured systems and improved management techniques. Each of these can be related to some variable affecting manpower availability and are summarized below:

(1) Absenteeism - In 1977, the sum of Metro operator sick leave and unexecused absences stood at almost 21 days per person annually, or eight percent. Through the combined effects of the MBO

system, a stricter discipline code, and a comprehensive driver performance reporting system, these two categories of absenteeism had been reduced by 50 percent by 1981.

- Sick leave has been reduced to 8.7 from 17.8 days per person.

- Unexcused absence and late reports have been reduced to 1.65 from 2.89 days per person

(2) Scheduling of Part-Time Driver Assignments - Although Metro was authorized a 50 percent part-time driver level in early 1978, it was not until 1980 that substantial progress was made toward that goal. A number of factors contributed to this situation (e.g., peak service additions did not occur as planned; a manpower shortage occurred in the lag between the commencement and conclusion of labor negotiations), but the inability or resistance to creating tripper assignments continued to be a factor after the other problems subsided. Two improvements were made:

- Communication between Base Operations and Scheduling was improved; agreement is now reached on how many trippers and full-time assignments to create prior to actual runcutting.

- RUCUS' parameters and runcutting steps were modified to maximize its ability to produce trippers.

(3) Days-Off Combinations - All Metro operators are entitled to two consecutive days-off per week. Prior to the current labor contract, a complicated driver pick system was in effect which produced a number of open straight runs on Sundays. This caused staffing problems on Sundays and required the allocation of open trippers to extraboard operators during the week, preventing their assignment to part-timers. An "open" pick is now in effect, freeing up more trippers for part-time use. A computer program (presented in Exhibit A) is used to generate an inventory of day-off combinations from which the drivers draw, thus improving operator availability and utilization on all days.

(4) Annual Projection of Hiring Needs - In preparation for Fiscal Year 1980 (i.e., January through December), Metro went through several rounds of detailed budget reviews as service plan assumptions were changed. The Base Operations Division already had in place a manual manpower and hiring needs projection technique, inclusive of all the variables introduced in Exhibit II-1. This technique, applied on a weekly basis, was automated to increase its value as a management tool (discussed in Appendix A). It is now used for annual and interim projections of weekly hiring needs.

(5) Interface Between Base Operations and Personnel - Metro's large and frequent service increases several times resulted in hiring crunches, at best, or manpower shortages, at worst, as Personnel attempted to respond to unanticipated hiring demands. Although the worst situations were caused by predictive errors (i.e., service additions over 100 percent greater than anticipated), there surfaced a need for a structured approach to communicating advance hiring needs. This interface has now stabilized and is supported by the following events:

- Manpower levels are monitored weekly, respective of hiring projections; consensus on needs is reached at a weekly Base Operations staff meeting attended by all base superintendents.

- A joint weekly meeting is held, with Personnel, Base Operations, and Instruction in attendance, to agree on short-term hiring needs.

The above five events were particularly effective in defining the timing and nature of important organizational interfaces. These administrative procedures are correlated with the functional activities and techniques of Metro's manpower planning process in the following section.

Description of the Manpower Planning Process

The manpower planning process at any transit system can be described via the service implementation process. Metro's functional activities (i.e., work tasks) and manpower planning activities as regards service implementation are summarized in Exhibit III-1. These activities, and their integration, are described below.

1. The Functional Activities Create Information Used To Guide Tactical and Strategic Operator Availability Decisions

The functional activities described in Exhibit III-1 are, for the most part, common to all transit systems. What distinguishes one system from another are the time frames within which they are accomplished and the specific techniques which are utilized. Metro's distinguishing characteristics are summarized as follows:

- Service planning produces an annual service plan for input to the budget process
  - The number of annual and budgeted (i.e., those to be operated in the current fiscal year) platform hours are part of the budget approval
  - Peak and off-peak service changes are identified -- an example for September 1983 is shown in Exhibit III-2
- Scheduling molds their runcutting process to meet specified service change objectives
  - Objectives indicate number and length of assignment types
    - Straight runs and combinations (i.e., split runs) should meet minimum threshold in contract -- presently 666 runs

EXHIBIT III-1
SEATTLE METRO'S MANPOWER PLANNING PROCESS

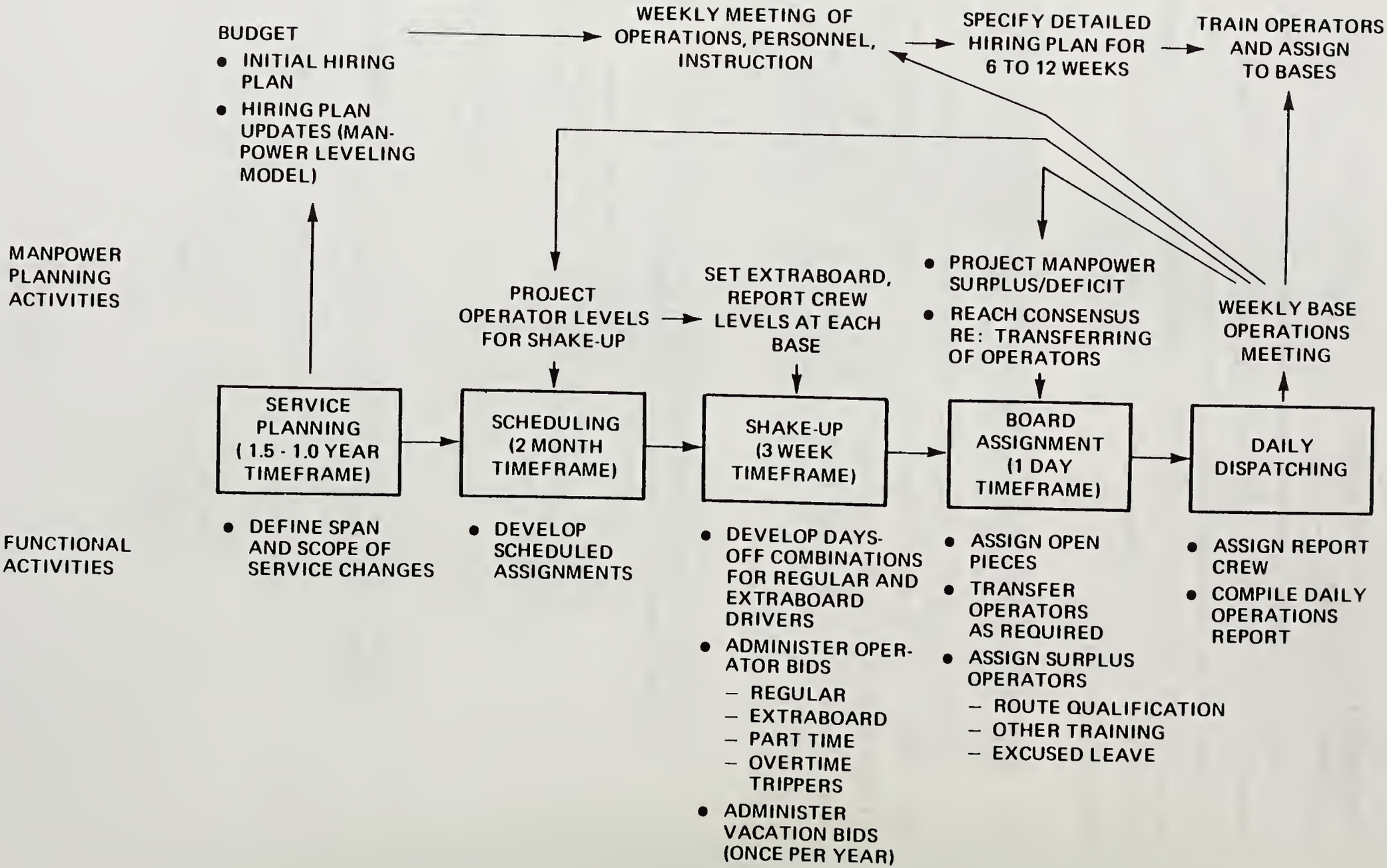


EXHIBIT III-2
1983 SERVICE ADDITIONS

Revised 11/10/82
SEG

September .33

PROJECT	City of Seattle Peak Hours	City of Seattle Off-Peak Hours	King County Peak Hours	King County Off-Peak Hours	Annual Hours	Budget Hours	Coaches AM	Coaches MID	Coaches PM
Northgate/Kenmore	1,500	1,100	1,500	1,200	5,300	1,700	2	3	2
Woodinville P&R			8,000		8,000	2,600	6		6
Bellevue Incentive Hours			3,000	1,400	4,400	1,500	2	1	2
Renton II P&R Lot		6,000	8,000	6,000	20,000	6,600	4	3	4
Vashon Island			500		500	200	2		-1
Pacific Highway S.			5,000		5,000	1,600			2
Federal Way/South Center			4,000	2,000	6,000	2,000	2	1	2
W. Seattle Bridge Adjustments	1,300				1,300	400	1		2
U of W/Magnolia	2,000				2,000	700	2		2
Subscription Service			5,000		5,000	1,600	5		5
Total	4,800	7,100	35,000	10,600	57,500	18,900	26	8	26
Cost @ $47/Hour	$225,600	$333,700	$1,645,000	$498,200	$2,702,500	$888,300			

Peak Hours - 69%
Off-Peak Hours - 31%

.. Bid overtime trippers should be 1:40 in length and meet contract specifications -- currently 72

.. Maximize part-time trippers with length greater than 2:20

- RUCUS processing was modified to maximize tripper-creating opportunities

.. Straight runs cut first, attempt to hold out early and late trippers

.. Combinations formed initially with a tight spread (i.e., 11 hours), then optimized with a looser spread (i.e., 11.5 hours)

. Shake-up (i.e., service change) supervisor modifies RUCUS output to best match projected manpower levels

- Extraboard tripper combinations are formed from longest trippers if full-time operators are at a surplus

- Several solution sets for days-off combinations are produced for driver bids

.. Different solution sets assume open runs on different days to maximize preferable day-off pairs (a union relations consideration)

.. As driver bid progresses, the solution sets are narrowed to one

. Board assignment will be enhanced in near future with automated aids

- BOSS (Base Operations System) implementation next year

.. Absence information of all types to be kept on real time basis

.. Tripper assignment to extraboard will be automated; combinations will be defined through a cost optimization routine

- Board planners are kept informed of surplus/deficits at other bases

- Training and excused leave used as safety valves

. Daily dispatching is responsible for report crew assignment

- Early report operators are split (i.e., assigned an afternoon report) if they receive no assignment or a tripper

- List is maintained for operators desiring to work on their day off.

2. <u>The Manpower Planning Activities Provide A Framework For Evaluating Annual Strategies And For Defining Short-Term Modifications</u>

Metro's manpower planning activities emanate from three basic elements:

(1) The budget process defines an initial hiring plan based on service plans, attrition and absentee assumptions, and training class lengths and capacities.

(2) The weekly Base Operations staff meeting is the focal point for tactical decisions on operator availability.

. Interim projections are made for hiring needs, vacation schedule changes (note: Metro has three systemwide picks, confounding prediction of operators off on vacation)

. Transfers of operators among bases are facilitated via weekly manpower projections (Exhibit III-3)

. Driver levels by type are projected for the service change (i.e., shake-up) date

. Decisions are reached on allocation of new trainees to specific divisions

EXHIBIT III-3
WEEKLY MANPOWER PROJECTIONS SHEET

	AT	NS	EB	SB	RY	TOTAL
PT	103	225	239	243	82	892
FT	334	213	177	266	139	1129
TOTAL	437	438	416	509	221	2021
OPEN TRIP	4/12	11/5	3/8	5/12	1/1	24/38
VACATION	10	13	8	8	5	44
AVE VAR	2.2	-2.6	13.6	3	16	17.8

DAILY SUMMARY

	SAT	SUN	MON	TUE	WED	THURS	FRI
AT	11	12	5	2	3	1	Ø
NS	5	9	2	-2	-5	-2	-6
EB	3	9	12	15	17	13	11
SB	7	2	Ø	3	2	8	2
RY	4	6	1	Ø	2	3	2
TOTAL	30	38	20	18	19	23	9

(3) The Weekly Personnel/Instruction/Operations meeting is a critical interface in specifying short-term hiring needs and identifying applicant inventory

- . Screening of part-time drivers for full-time positions is of major importance
  - 85 percent must come from part-time
  - Screening, based on performance, takes six weeks to accomplish
- . Application-to-qualification period for full-timers spans 2.5 months
- Part-timers are most frequent hires, a 40-person "ready to go" inventory is maintained

Metro's MBO system acts as a managerial control on the results of the above activities. If a manager's performance is declining due to manpower planning problems, the MBO system provides an incentive to take action. The organizational interfaces defined above provide a vehicle for this feedback. The MBO system's design is described in the following section as it relates to the Base Operations organization structure.

MBO System

Managers in Metro's Base Operations Division acknowledge that the MBO system has a significant influence on operator availability. Three factors explain why this is so:

- . Five of the six objectives quantifiably address aspects of operator availability management;
- . The organization structure secures direct accountability for performance in managing operator availability; and

- Procedures and information systems achieve top-down integration in monitoring performance.

The results of this system's application have been impressive. Metro has achieved considerable improvement in operator availability as well as overall operator performance, as shown in Exhibit III-4. Three additional objectives -- the pay hour to platform hour ratio, report operator hours, and cancelled trips -- were included in the system in 1982. These provide more emphasis on the efficiency side of the performance equation. The factors which appear to contribute most to the MBO system's success in improving operator availability are explained below..

1. The Performance Indicators Used As MBOs Measure Both The Efficiency And Effectiveness Of Operator Availability Management

The five Base Operations performance indicators relevant to operator availability, and their meaning, are as follows:

(1) Sick days per operator per year is a measure of manpower availability and directly reflects the level of additional manpower required to operate a schedule.

(2) Late reports and unexcused absences per operator per year measures a less predictable aspect of manpower availability and reflects upon management control.

(3) Minutes of service delay is an effectiveness indicator which measures the resilience of the manpower plan in meeting scheduled service.

(4) Pay hour to platform hour ratio is an efficiency indicator measuring productive use of the work force.

(5) Report operator hours is an efficiency indicator measuring the extent to which report operators were available for work but not utilized.

EXHIBIT III-4
SEATTLE METRO
BASE OPERATIONS MBO PERFORMANCE

Incidents per Operator per Year	1977	1978	1979	1980	1981
Sick Leave	17.80	11.70	10.10	9.30	8.70
Late Reports and Unexcused	2.89	2.79	2.31	2.30	1.65
Accidents (Preventable)	0.68	0.57	0.48	0.35	0.32
Complaints	5.60	4.40	3.10	2.30	2.40

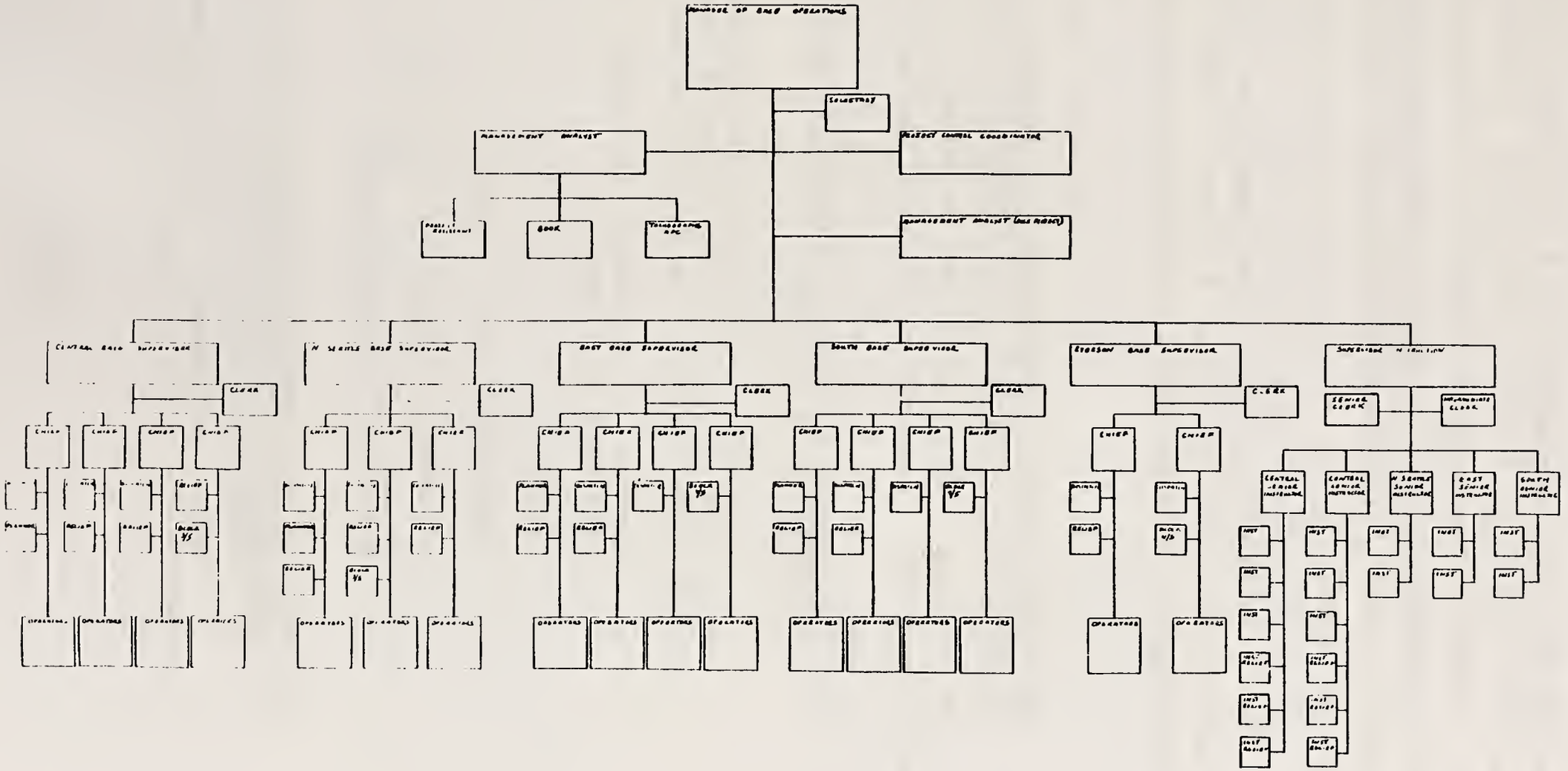
These performance indicators adequately measure Base Operation's performance, even though responsibility for some is not wholly attributable to this department. Some overlap exists, for instance, between the pay hour to platform hour ratio and report operator hours. Further, the former of the two is largely attributable to scheduled pay hours, and can vary considerably on a monthly basis. Nonetheless, the results of Base Operations management actions are manifested in the measures, and they are accepted as a standard of performance. Their basis of success at Metro, however, is not in what they measure; rather, success can be attributed to the way they are integrated with the organization structure.

2. The Evaluation And Compensation System Recognizes That Each Manager's Performance Is Contingent On That Of His Subordinates

The success of the transportation function, especially as regards operator availability, is highly dependent upon management's working relationship with operators. The Base Operations Division at Metro employs a decentralized organization structure, as shown in Exhibit III-5, to promote consistent and familiar working relationships. Accountability is unambiguous. Base superintendents are afforded some latitude in managing their resources, as well as an opportunity to delegate authority. Each Base Chief directly manages a group of operators and one or more dispatchers, and is empowered to terminate as well as discipline operators. Thus, three of the five management objectives can be traced directly to first-line supervisors.

Base Operations management personnel are evaluated based on their performance. With the exception of base chiefs, some

EXHIBIT III-5
SEATTLE METRO
BASE OPERATIONS ORGANIZATION STRUCTURE



portion of their compensation is based on performance. Everyone, for instance, receives applicable cost-of-living increases. Superior performance, based on a 12-step progression, may pay an additional eight percent above salary plus COLA. Conversely, unsatisfactory performance may result in a six percent pay cut.

Each manager's, even each operator's, performance is tracked by several reporting systems. These systems add the third leg to the milkstool in rounding out the MBO system.

3. Three Reporting Systems Assist In Measuring Performance At The Strategic, Tactical, And Operational Levels

The data driving all three systems originate from the operating bases. Each system is briefly described below.

(1) The Accident/Incident System Tracks All Aspects Of Operator Performance

This automated system also provides an audit trail for the performance of each base chief and base superintendent, as related to the following:

- Absence - incidents by every category of time away from work
- Accidents
- Complaints and infractions
- Outcome of discipline hearings
- Record of operator contact

(2) The Transit Operator Payroll System Provides A Breakdown Of Operator Pay Hours

This automated, exception-based system reports pay hours on a monthly basis by operating

base. It supports the calculation of the pay hour/platform hour ratio, and reports operator hours.

(3) The Weekly Operations Report Provides Basic Information On Operator Availability

This manual report, shown in Exhibit III-6, summarizes daily activity at each operating base. It is the primary document for monitoring manpower levels and service cancellations.

When Metro's Base Operations System (BOSS) is implemented, the information reported through these three separate systems will become more integrated. Absence information, for instance, will be maintained on a real-time basis. This will enable automatic extraboard assignment as well as reduce the number of manual forms now required to record operator assignment. Additionally, an interesting component of BOSS will be an optimization routine used to determine minimum cost tripper combinations. This technique is briefly described in the Appendix.

* * * * *

Seattle Metro has realized improvements in operator availability management largely through management and procedural innovations. Although some major contributing factors are unique to Seattle's operating environment (e.g., part-time labor, driver performance code), there are at least three items which are of generic applicability:

- Decentralization of the transportation organization and integration of the MBO program.

EXHIBIT III-6
WEEKLY OPERATIONS REPORT

WEEKLY OPERATION STATUS WORKSHEET

Base North Seattle

Date Completed November 15, 1982

For Week Ending November 14, 1982

BASE OPERATIONS
NOV 16 1982

	8 MON	9 TUE	10 WED	11 THU	12 FRI	13 SAT	14 SUN
Regular Operators	151	151	151	151	151	151	151
Extra Board	53	53	53	53	53	53	53
^Report	8	8	8	8	8	8	8
Part-Time	226	226	226	226	226	226	226
New Operators							
PT							
FT							
Total Operators	438	438	438	438	438	438	438

^Do not include picked reports in extra-board count

# Operators on Suspension/ Infraction Code #	MON	TUE	WED	THU	FRI	SAT	SUN
	0	0	0	0	0	0	0

# Attrition/Term. Code #/ Infraction Code #'s (PT-FT)	MON	TUE	WED	THU	FRI	SAT	SUN
	0	0	0	0	0	0	0

Infraction Code is the number of the category of minor or major infraction
Termination Code: S = resign. H = retire. L = disch. X = prob. term. Q = death

BASE PLANNER

	MON	TUE	WED	THU	FRI	SAT	SUN
Vacation	9	8	9	11	12	10	7
Sick/Injury	5	6	5	5	7	4	3
Detailed	1	0	0	0	2	3	0
Industrial Injury	4	5	4	3	3	2	1
Personal Holiday	0	1	1	0	0	0	0
Excused	10	11	13	11	9	7	9
Other	6	6	5	6	6	1	3
Pieces of Work Assigned OT	2	4	0	4	3	6	2

BASE DISPATCHER

	MON	TUE	WED	THU	FRI	SAT	SUN
Sick	4	4	2	3	6	1	2
Industrial	0	0	0	0	0	0	0
Excused	1	3	1	2	0	2	0
Late Report	3	0	2	3	3	1	1
Unexcused	2	0	2	3	2	0	0
Double Assignment	0	0	0	0	0	0	0
Not Qualified	0	1	0	0	0	0	0
Change for Base	2	0	0	0	0	0	0
Other	0	1	2	2	1	0	1

ACCIDENTS

	1 MON	2 TUE	3 WED	4 THU	5 FRI	6 SAT	7 SUN
Traffic	3	0	0	0	0	0	0
Passenger	0	0	0	0	0	0	0

RED CARDS

	MON	TUE	WED	THU	FRI	SAT	SUN
Received (OT/Other)	137	3 141	4 181	241 —	6 0 153	101 —	3 1
Processed							
Pending							
Over 15 Days							

COMPLAINTS

	MON	TUE	WED	THU	FRI	SAT	SUN
Received	0	0	0	26	0	0	0
Processed	5	3	1	4	12	0	0
Pending	19	16	15	37	25	25	25
Over 15 Days	4	3	3	3	2	2	2

TOLERANCE INDICATORS (# of occurances/ # opr/week) x 52 = # of occurances/op/yr

Accidents	.356	/op/yr
Sick	6.530	/op/yr
Complaints	3.187	/op/yr
Late Reports & Unexcused	2.493	/op/yr
Trips Lost		/yr

TACHCHARTS

	MON	TUE	WED	THU	FRI	SAT	SUN
Received							
Processed							
Pending							
Over 15 Days							

INVESTIGATOR REPORTS

	MON	TUE	WED	THU	FRI	SAT	SUN
Received							
Processed							
Pending							
Over 15 Days							

R.D.A.s

SERVICE CONTROL

	MON	TUE	WED	THU	FRI	SAT	SUN
Received	4	0	2	0	0	0	0
Processed	2	4	0	0	0	0	0
Pending	8	4	6	6	6	6	6
Over 15 Days	2	1	1	1	1	1	1

BASE INITIATED

	MON	TUE	WED	THU	FRI	SAT	SUN
Received	0	2	0	0	2	0	0
Processed	0	0	0	0	1	0	0
Pending	0	2	2	2	3	3	3
Over 15 Days	0	0	0	0	1	1	1

SUPPS

	MON	TUE	WED	THU	FRI	SAT	SUN
Extra Unit							
No Extra Unit							
Current Total Extra Unit							
Current Total No Extra Unit							

GRIEVANCES

	MON	TUE	WED	THU	FRI	SAT	SUN
Received							
Pending							
Over 15 days							

PENALTY PAY

	MON	TUE	WED	THU	FRI	SAT	SUN
Hours	0	0	0	0	0	0	0

Reason: _____

Action Taken: _____

DELAYS

Date	Rt/Run	Reason	Action Taken
	1		
	1		
	1		
	1		
	1		

CANCELLATIONS

Date	Rt/Run	Reason	Action Taken
	1		
	1		
	1		

- Monitoring systems which support performance evaluation of managers as well as drivers.

- Interdepartmental communications which stress accountability for and timing of information.

By attacking these elements of the larger picture, more detailed aspects of operator availability management are addressed through the creativity of individual managers within their realm of responsibility.

IV. TWIN CITIES CASE STUDY

This case study describes the procedures and techniques utilized by the Metropolitan Transit Commission (MTC), in Minneapolis, St. Paul, to manage operator availability. MTC's experience over the five years with events affecting operator utilization mirror those of many U.S. transit systems. The need for control over operator manpower levels, for instance, became evident to MTC during periods of increases in transit service. MTC faced two problems associated with service expansion -- matching operator supply and demand on a daily basis, and accurately projecting operator wages and benefits as the workforce continued to grow. Now, however, MTC's primary concern is how to properly downsize their workforce. The need for control is lower, but not absent, because the range of decisions required in matching operator supply and demand are fewer. Coordination between Personnel and Transportation, for instance, is less critical because of no current or even projected hiring needs.

MTC's manpower planning and monitoring process is centered on a technique which they entitle Ideal Manpower Planning. Essentially, a short-term projection of manpower needs is performed on a quarterly basis. The efficiency and effectiveness of the resulting manpower levels are closely monitored, and reported on a monthly basis to MTC managers, the Commission Chairman and an Operations Committee. There is no formal setting of targets for performance as regards operator utilization. Rather, the visibility of performance is used as a vehicle to promote improvements in resource utilization.

The remainder of this case study provides some background on the evolution of MTC's approach to operator availability management, how the "ideal" manpower calculation is derived and incorporated into the overall manpower planning process, and how data describing the results of operator availability are collected and incorporated into the decision-making process.

Evolution of MTC's Approach to Managing Operator Availability

The approach now employed by MTC sprang from the operational problems caused by a simple and insensitive methodology previously applied in projecting manpower levels and the annual transit operator budget. A number of variables impact the need for and supply of operators at any given point in time -- service levels, vacation schedules, absenteeism, attrition and so forth. MTC had relied on a very simple formula which resulted in consistent shortage of operators. Essentially, both operator requirements and the annual budget were estimated via a driver-to-work ratio (e.g., 1.5 drivers per peak vehicle).

Under steady-state conditions, a simple formula such as the one applied by MTC would yield acceptable results. In the period between 1976 and mid-1980, however, several variables affecting manpower supply and demand were undergoing less than subtle changes. Absenteeism, for instance, climbed from 6.1 percent to almost 9.3 percent over this period. Changes in peak period service and the newly allowed (ca. 1978) use of part-time operators also served to skew MTC's driver to work ratio. In combination, these events produced a consistent undersupply of transit operators. While unscheduled overtime remained at a constant but high -- about 11 percent -- level,

MTC began to experience an unacceptably high number of missed trips. In fact, daily missed trips due to operator unavailability almost tripled in magnitude between Winter 1976 and Spring 1979, reaching a high of over 100 daily trips. Effectively, absenteeism, unscheduled overtime, and missed trips became a vicious circle, with each problem exacerbating the others.

MTC took five steps to bring this situation under control, as follows:

(1) An "Ideal" Manpower Level Was Developed for Each Operating Division

Almost every transit system having multiple operating facilities exhibits different operator supply and demand characteristics among those facilities. MTC developed a straightforward methodology for forecasting operator requirements, initially, on a monthly basis. This methodology, which is fully described in a following section (Setting Ideal Manpower Levels), relies upon the following data to produce a manpower estimate specific to each division:

- Scheduled runs for full-time drivers on weekdays, Saturdays and Sundays
- Open trippers to be operated per day
- Part-time driver levels
- Ability to fill short overtime pieces
- Expected attrition
- Vacation schedules
- Expected absence rates

"Ideal" manpower levels were tested at one division in June 1979 and eventually established at the remaining three divisions by mid-1980.

MTC found it necessary to hire an additional 137 full-time drivers over this period, or an increase of 10.8 percent. As would be expected, the incidence of missed trips dropped substantially, as shown in Exhibit IV-1. Further, because of the overtime expense incurred prior to implementation of the "ideal" levels, MTC actually experienced an improvement in the overall pay hour to platform hour ratio, also shown in Exhibit IV-1. The net effect of the action was a moderate reduction in total cost (i.e., the savings in payhours per platform hour slightly exceeded the increased benefits cost at MTC) and better schedule adherence.

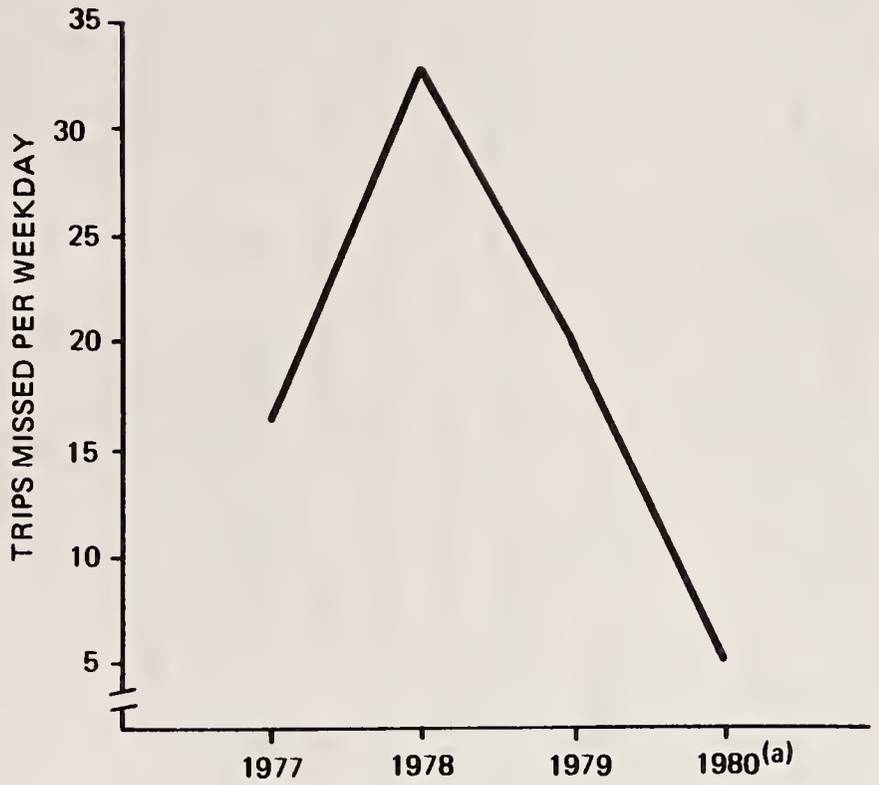
(2) An Interdepartmental Committee Was Established to Coordinate Manpower Planning Needs

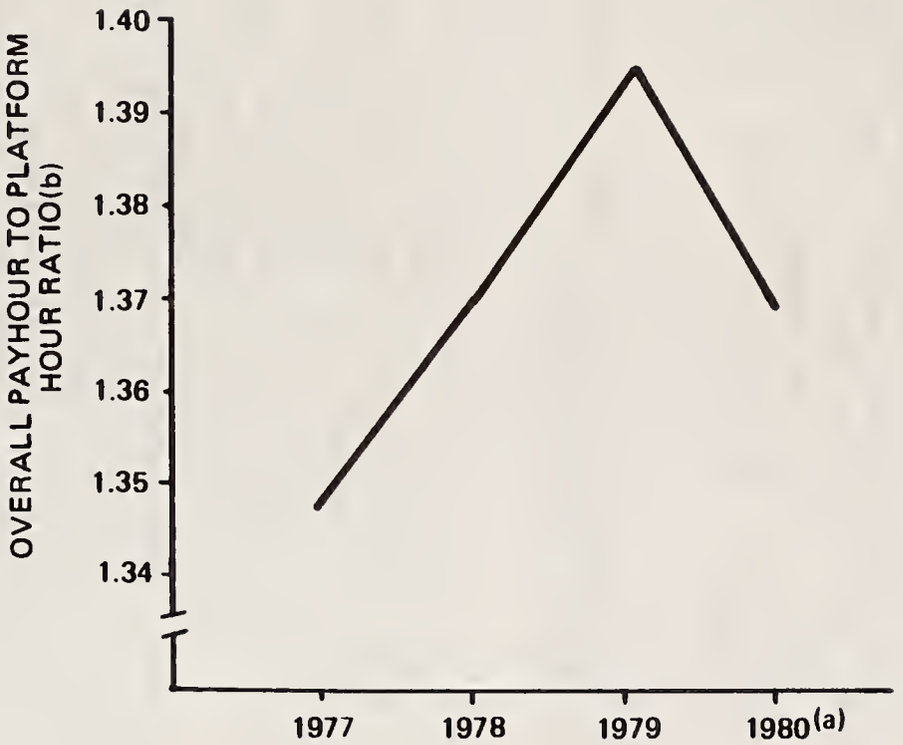
This committee was used as a vehicle to reach consensus on the timing and number of trainees required to maintain scheduled service. It was composed of respresentatives from planning and scheduling, research, personnel and transportation. Although the committee is no longer active in a formal sense, it did play an important role in improving coordination among the actors in the manpower planning process. Additionally, decisions as to where new drivers would be assigned, and thus would have to train, were communicated through this committee. Most members of this committee still meet to plan the requirements for periodic driver sign-ups.

(3) A Daily Operating Report Was Developed to Track Operator Utilization and Service Effectiveness on a Division Basis

This daily report provides information to management on the basic elements of operator supply and demand, as well as the results of the match between supply and demand -- operators available but not used and operators assigned at overtime. The daily operating report is incorporated into MTC's overall performance monitoring system, discussed in a subsequent section.

EXHIBIT IV - 1
IDEAL MANPOWER PLANNING EFFECTS ON SERVICE EFFECTIVENESS AND DRIVER PRODUCTIVITY





(a) First Six Months Only
(b) Excluding Fringe Benefits

SOURCE: Smith, et al. "An Approach to Ideal Manpower Planning," Transit Journal, American Public Transit Association (Fall, 1980)

(4) The Effectiveness of Extraboard Assignment Was Periodically Evaluated

The purpose of these evaluations is to monitor, in an operational sense, how effective ideal manpower levels have been in reducing uncheduled cost. They are performed by MTC's Research Staff, and thus potentially have the added value of an objective third party.

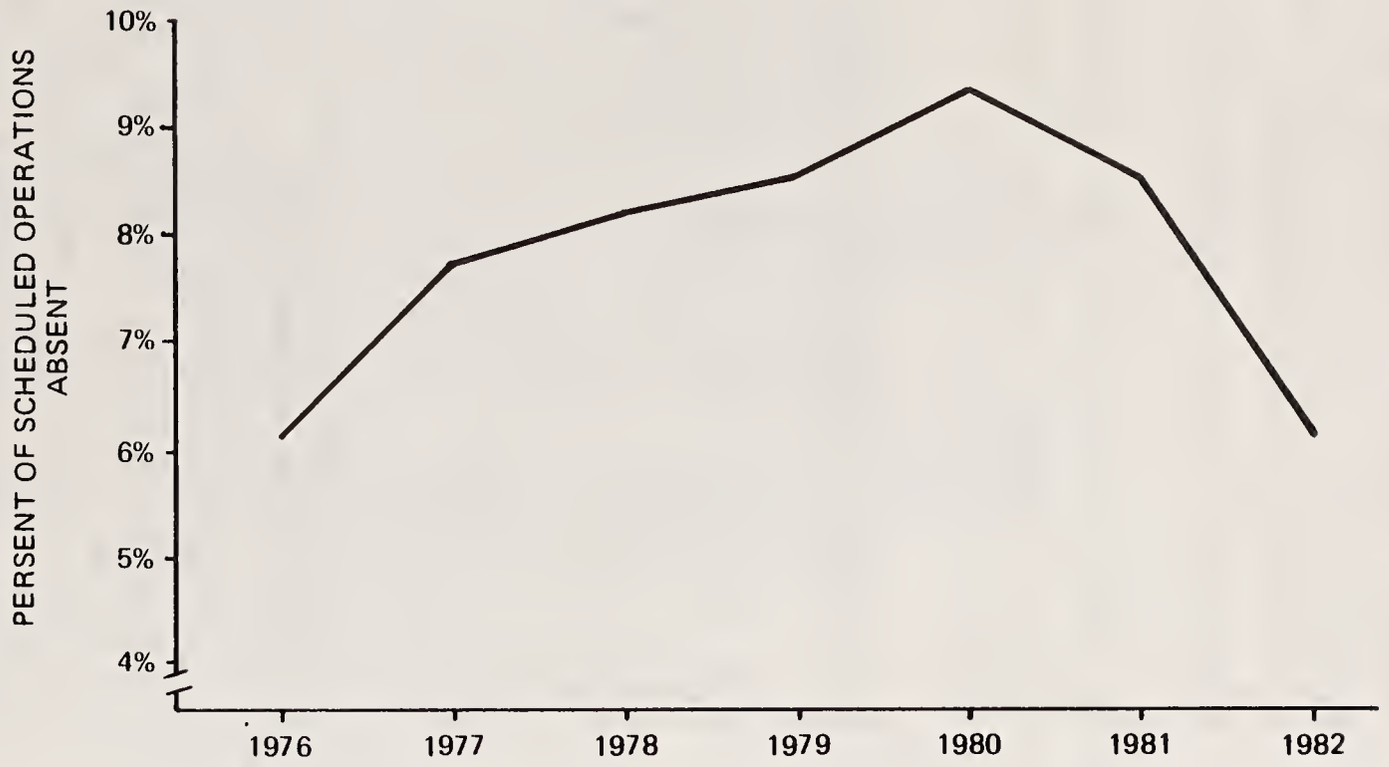
(5) An Operator Performance Code Was Developed to Promote Better Attendance

MTC's operator absenteeism rate climbed to a high of 9.3 percent in 1980 from 6.1 percent in 1976. MTC had hypothesized that absenteeism had been growing because of understaffing -- little opportunity existed for requested leave, but unpaid sick leave could be taken and "rewarded" through the ample opportunities for overtime work. In fact, however, absenteeism continued to grow after ideal manpower planning was in place, as shown in Exhibit IV-2. As a result, MTC began preparation of an attendance policy incorporating progressively stiffer discipline for poor attendance. Preparation, and thus knowledge, of this began in the summer of 1981, and the new policy became effective in December of that year. The tremendous reduction in absenteeism during 1982 verifies this program's success.

Setting Ideal Manpower Levels

The manpower leveling methodology employed by MTC is designed to determine requirements for three driver categories -- drivers bidding regular assignments, extraboard drivers and part time drivers. They are considered "ideal" levels because they represent the minimum number of drivers required, on average, to meet scheduled demand. That is, they account for scheduled work, absences, vacations and other work normally

EXHIBIT IV - 2
MTC OPERATOR ABSENTEEISM



left open (e.g., peak period trippers) but assigned to the extraboard in some fashion (e.g., in combinations or at overtime). The process follows these four steps:

- A complete run cut is performed
- Regular driver requirements are determined
- Trippers are classified into three categories by the division superintendents
- Extraboard driver requirements are estimated

Each of these four steps are explained below. An example of the working document used in calculating ideal manpower levels is given in Exhibit IV-3.

(1) MTC's RUCUS System Is Used to Produce Scheduled Driver Assignments

A run cut is completed for each division from six to eight weeks prior to implementation of scheduled service. Constraints on the runcutting process include a weekly 60 percent minimum for straight runs, a maximum spread of 12 hours and spread premium payment for work extending beyond 10.5 consecutive hours. All regular runs (i.e., straight runs and split runs) must be picked. There is no bidding of overtime trippers.

(2) Regular Driver Requirements Are Calculated Based on Weekly Run Requirements

Regular drivers operate straight and split runs. The number of regular drivers required is a function of how many runs are scheduled over the schedule cycle -- seven days in MTC's case -- and how many days one driver works during the cycle,.normally five. In the example provided by Exhibit IV-3, MTC has 905 runs operating during the schedule cycle, thus requiring 181 regular

EXHIBIT IV - 3
IDEAL MANPOWER PLANNING WORKSHEET

PROPOSED IDEAL SCHEDULED OPERATION

Shop	Wk. one Pc.	Rte	Runs Wk	Runs Sat	Runs Sun	Runs Hol
		1				
		2			2	2
		3				
		4				
		5				
		6				
		7				
		8				
		9	15	11	7	7
		10				
		11				
		12				
		13				
		14				
		15				
		16				
		17			7	7
	7	18	19	12	6	6

Division *Nicollet* Effective *Feb 12, 1983*

	AM	PM
	76	69
PT	17	15
	59	54
OT	19	14
	40	40

Extra Driver	Sat.	Sun.	Mon.	Tues.	Wed.	Thur.	Fri.	
Comb.	20	8	40	40	40	40	40	
Call	3	1	7	7	7	7	7	
Sick	15	6	25	25	25	25	25	
Off	8	4	6	6	6	6	6	
Trainers	—	—	—	—	—	—	—	
Required	46	19	78	78	78	78	78	= 455 ÷ 5 = 91
Off	45	72	13	13	13	13	13	= 182 ÷ 2 = 91
Sub Total	91	91	91	91	91	91	91	
+2 Vacation	15	15	15	15	15	15	15	
Total	106	106	106	106	106	106	106	

Total Weekly Requirements (455) — Weekly Extraboard Requirements (91)

22 FT

RegDrivers	Sat.	Sun.	Mon.	Tues.	Wed.	Thur.	Fri.	
RunsWorked	79	41	157	157	157	157	157	= 905 ÷ 5 = 181
Days Off	102	140	24	24	24	24	24	= 362 ÷ 2 = 181
RegDrivers	181	181	181	181	181	181	181	

Total Runs (905) — Regular Drivers (181)

157 Reg Runs + *24* Swing = *181* + *106* Ex. Dr. = *287* Dr.

Overtime A.M. *19* P.M. *14*

Division Percentage of One Piece Runs

One Piece Weekday *24* Total Weekday *157*

	XS *120*		XS *785*
Saturday	79	Saturday	79
Sunday	41	Sunday	41

Total One Piece

operators. The allowable number of regular operator days off is calculated simply as the difference between total regular operator requirements (i.e., 181) and the number of scheduled runs on any given day. When regular drivers bid a run, they select their days off based on this distribution.

(3) Trippers Are Classified As To Whether They Are Assigned At Overtime, To Part Time Drivers Or As Combinations To The Extraboard

In addition to straight and split runs, a number of short pieces of work are contained in the schedule which do not fit within contractually legal runs. These assignments, called trippers, can be assigned in one of the three ways given above. Each method of assignment usually has a unique cost impact. Trippers assigned to part-timers always cost the least; overtime trippers cost less than tripper combinations up to a point, generally around six platform hours considering MTC's wage and benefits cost structure.

MTC follows a three step process to "ideally" assign these trippers in one of the three ways defined above. Their actual daily assignment can and does differ as manpower availability varies through the week. The ideal assignment, however, provides an important component of forecasting manpower levels cognizant of part time drivers and the level of overtime work which is operationally feasible. The three steps which MTC employees utilize to determine ideal tripper assignments are:

. Overtime tripper levels are initially determined by the scheduling section

  - each division's capacity to absorb overtime trippers is derived from historical daily assignment data

  - initial estimates are refined via contact with transportation division managers

- remaining AM and PM trippers are eligible for assignment to part time or combinations

. Tripper combinations are developed with the objective of minimizing non-productive pay

- initial targets for combinations and part time trippers are set by the scheduling section

- critical trippers (i.e., those where the system can least accept a missed or late trip) are screened out for eventual assignment to part time operators

  .. distant routes in areas with unclear street signage, thus requiring familiarity

  .. other assignments where driver consistency is a plus (e.g., school work)

- remaining trippers are considered for combinations. (MTC's labor agreement specifies a maximum percentage of split runs; split runs exceeding this limit must be assigned to the extraboard.)

  .. maximum spread time is overriding concern

  .. select combinations paying closest to eight hours

. Part time trippers consist of those falling through from the above two screens

- part time drivers can work up to 30 hours per week, two pieces per day

- work consists of "most difficult" trippers from above and tripper combinations exceeding the target

(4) Extraboard Driver Requirements Are Calculated From Daily Tripper Combinations, Absence Estimates And Vacation Levels

The number of tripper combinations on weekdays, Saturdays and Sundays form the basic demand set for the extraboard. Added to this are estimates of drivers needed to be "on-call" (or stand by) and estimates of drivers on sick leave or absent for other reasons. The weekly requirement for the extraboard drivers is then determined, and drivers on vacation are added in. These basic steps are described below:

- The number of drivers on call, for planning purposes, is worked out jointly between the Scheduling section and each division. Parameters affecting this decision include:
  - the amount of call time (i.e., unscheduled guarantee) paid during the period of the last driver pick
  - changes in absence rates
- The number of drivers sick and on other leave is determined from the previous quarter and the same quarter of the previous year.
  - this number is expressed in terms of full time equivalents
  - each part time driver set equal to 60 percent of a full time driver
- The total number of extraboard drivers required over the week is calculated in the same manner as for regular drivers (see Exhibit IV-3)
  - total weekly requirements are calculated (i.e., extraboard requirements for Saturday, plus Sunday, plus five times the weekday requirement, or 455 in the case of this example)

- weekly requirements are divided by five to yield the total number of extraboard drivers required over the week (i.e., in the example 455 ÷ 5 = 91)

. The number of drivers on vacation is added to total extraboard requirements

- weekly vacation levels are known from vacation sign-up (i.e., 15 in the example)

- variations in vacation levels within a sign-up period are made to coincide with variations in service levels

The ideal manpower planning methodology offers a simple and straightforward means of developing targets for manpower levels. It has proved to be, however, somewhat insensitive to significant changes in MTC's attrition and absenteeism rates. Both of these factors affecting manpower availability declined markedly in calendar year 1982. As a result, while actual manpower levels fell below the calculated ideal (as shown in Exhibit IV-4), MTC experienced an increase in both the "net" pay hour to platform hour ratio and the "gross" ratio (as shown in Exhibit IV-5). The net figure includes driving and non-driving, but working, time. The gross figure includes net pay hours, plus paid leave hours, and includes other fringe benefit cost expressed in terms of pay hours. Prior to deceleration in attrition and absence, the ideal process has consistently yielded positive results.

Description of MTC's Manpower Planning Process

The description which follows addresses the timing and content of functional activities (i.e, work tasks) and manpower planning activities in the context of the service

EXHIBIT IV - 4
FULL - TIME DRIVER MANPOWER
(ACTUAL VS. IDEAL) 1982

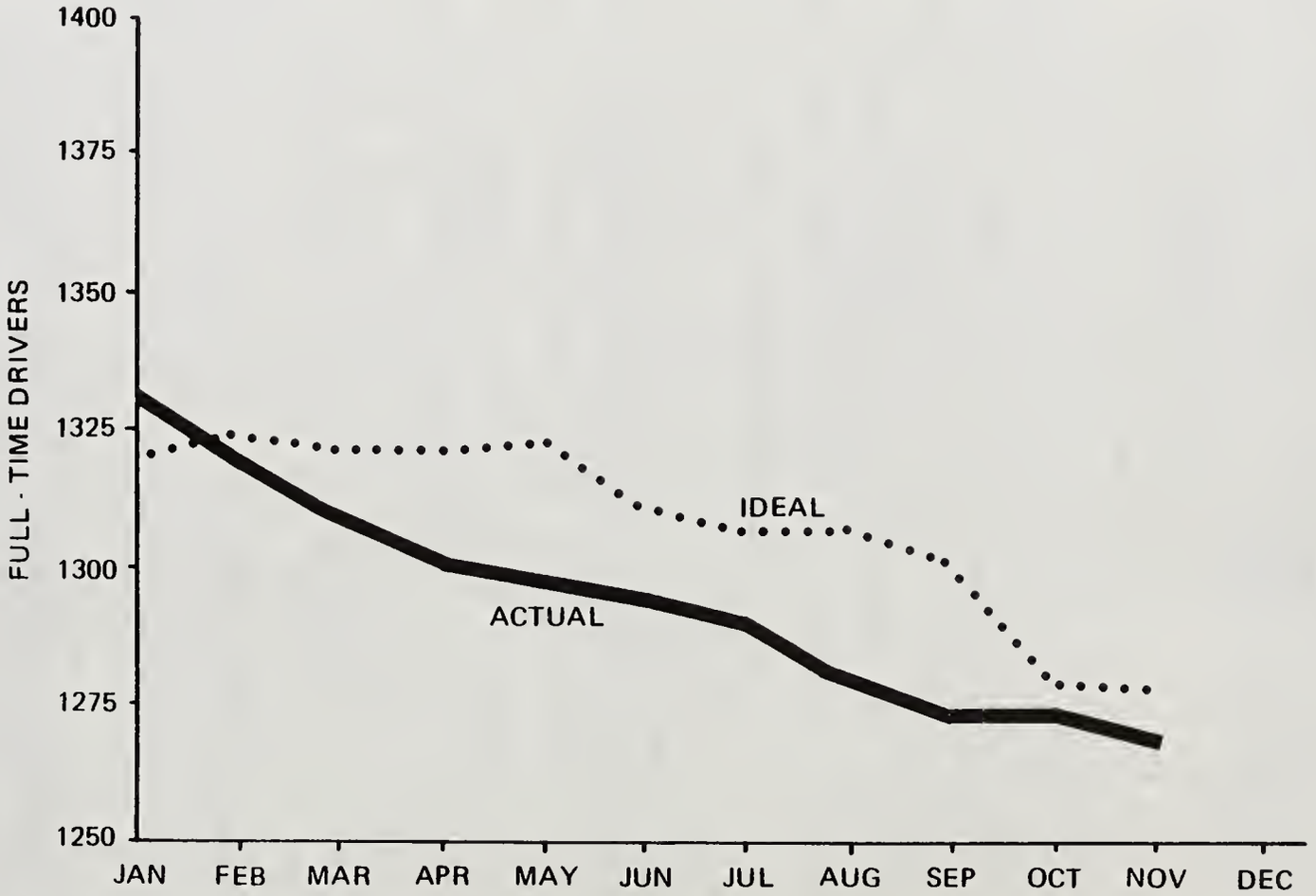
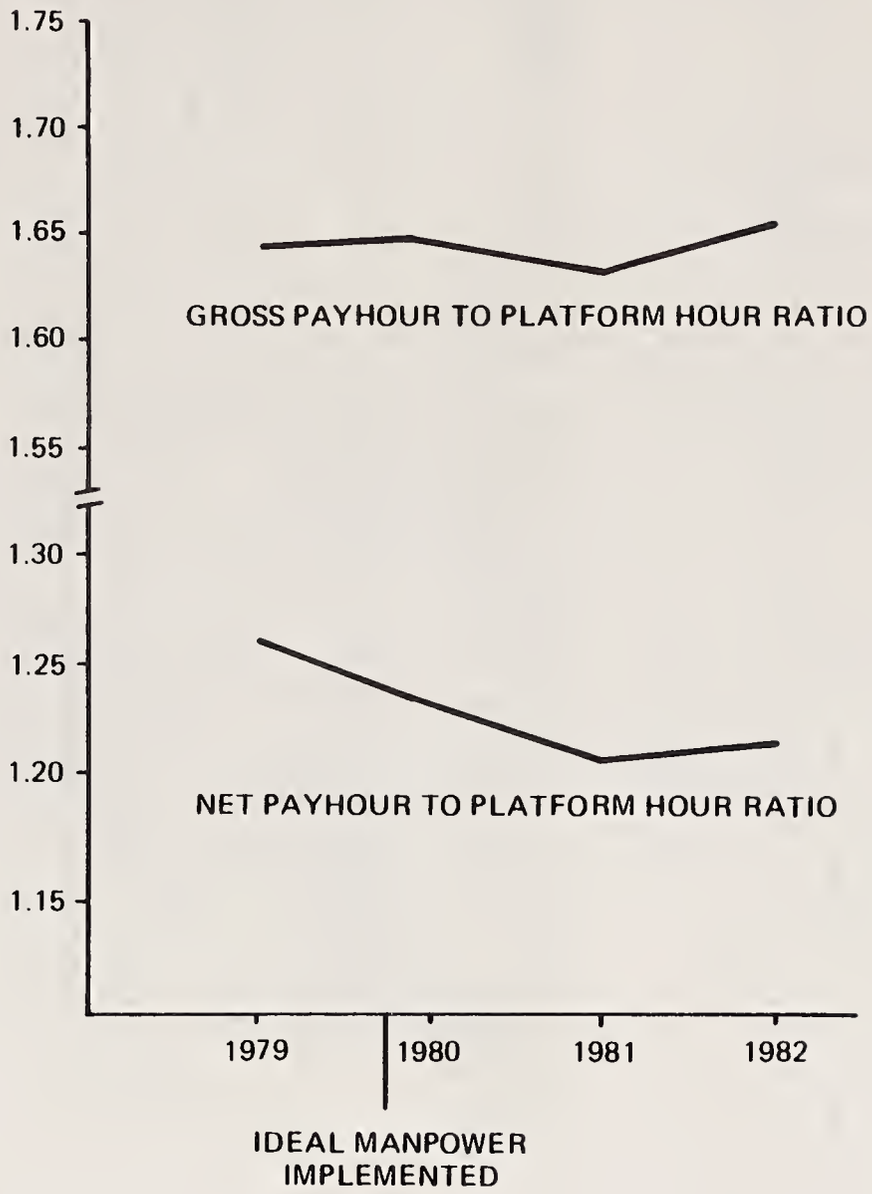


EXHIBIT IV - 5
TRENDS IN LABOR PRODUCTIVITY AT MTC



implementation process. The Ideal Manpower Plan, discussed in the previous section, is one component of the overall manpower planning process. The remaining components, and their integration, include procedures which yield flexibility to vary manpower availability in response to variations in demand.

The manpower planning process followed at MTC is depicted in Exhibit IV-6. As mentioned previously, MTC has been reducing service levels for some time. As a result, some of the activities have become less of a priority than they heretofore had been. Any activities addressing hiring, for instance, are dormant for the time being. The purpose of the following discussion is to describe all these activities as they normally would occur.

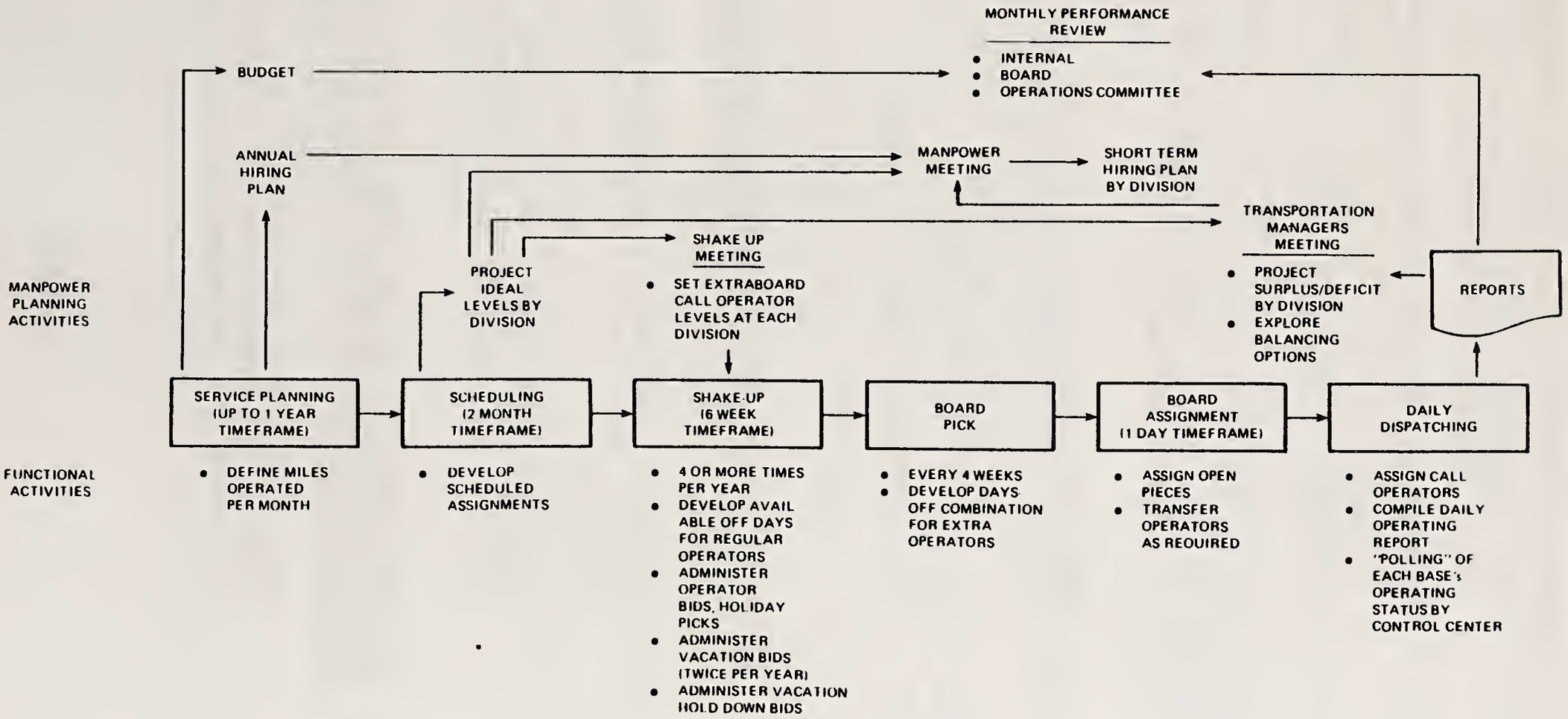
1. THE FUNCTIONAL ACTIVITIES CREATE INFORMATION USED TO GUIDE OPERATOR AVAILABILITY DECISIONS, AND INCLUDE PROCEDURES TO ADJUST AVAILABILITY IN RESPONSE TO NEED

While most of the service implementation components at MTC are common to any transit system, some are uncommon or have unique functional activities associated with them. Each of these functional activities are briefly described below within the context of six steps progressing toward daily service implementation:

(1) Service Planning Develops Estimates of Vehicle Miles to Be Operated Per Month

- These become the basis for the driver wage budget
- They also act as a guide to scheduling for the amount of service to be added or deleted

EXHIBIT IV-6
MTC's MANPOWER PLANNING PROCESS



(2) Scheduling Develops Daily Driver Assignments

- MTC has five operating divisions, each of which belongs to one city division
- Depending on projected operator availability, scheduling may alter the division assignment of open trippers or entire routes to yield a better balance
  - if routes are moved, a city-wide pick must be held
  - if only open trippers are moved, no pick is required
- MTC can alter the schedule at their discretion
  - a minimum of four driver picks are required per year
  - presently have six picks
  - no picks can last more than 16 weeks

(3) Shake-up (i.e., Service Change) Planning Is Guided By Ideal Manpower Levels And Attempts to Balance Manpower Among Divisions

- Vacation bids are made twice per year to reduce the impact of drivers moving among divisions
- Vacation hold-downs and holiday picks are made at every shake-up to increase predictability in assigning work

(4) An Extraboard Pick Is Held Every Four Weeks, Providing Interim Means to Match Operator Availability to Demand

- The extraboard assignments are rescheduled every four weeks to reflect interim changes in manpower availability (arising from

monthly changes in vacations, absenteeism, etc.) and chosen by seniority in the four-weekly "pick". Also develops days-off combinations for extra operators.

- Hold-downs for long-term illnesses are made weekly
- Allowed days off for extraboard drivers can be recalculated every four weeks
- This allows MTC to adjust extraboard driver supply to variations in demand among weekdays, Saturday and Sunday (e.g., in response to high seniority drivers being off on weekends)

(5) Board Assignment Can Temporarily Transfer Operators Among Divisions On A 24-Hour Basis

- Tripper assignment may be modified from "ideal" by moving open trippers among divisions to adjust for manpower surplus/deficits without having to move drivers
- Excused leave used as a safety valve in manpower surplus situations (i.e., encourages use of requested day-off as a means of reducing surplus)

(6) Daily Dispatching Is Responsible For Assigning Call Operators

- Call operators are split if they did not receive a full day's assignment initially
- Shop transfers of buses, road calls used to take up slack

2. THE MANPOWER PLANNING ACTIVITIES FOCUS ON MAINTAINING IDEAL MANPOWER LEVELS

Ideal manning is generally considered the benchmark against which MTC evaluates manpower levels. As explained earlier, ideal levels are recast with each driver pick, or

shake-up. In MTC's downsizing mode, this comparison addresses management of attrition and service levels. Prior to commencement of service decreases, the ideal levels were used to validate and update the annual hiring plan. In any case, there are four points of review where actual and projected manpower levels are compared against the ideal:

(1) The Transportation Managers Meeting Reviews the Effectiveness And Efficiency of Current Manpower Levels

- Data summarized from dispatching activities and payroll provide input on effectiveness (e.g., missed or late pull-outs) and efficiency (e.g., pay hour to platform hour ratio, call time)
- Meetings are held at least monthly and are basis of decision for transferring extra-board operators or, depending on extremes, initiating a new shake-up

(2) A Separate Manpower Planning Meeting Was Held Weekly When MTC Had Frequent Hires

- Purpose was to coordinate needs and make hiring recommendations; transportation, scheduling, personnel and research attended
- Now held only in advance of driver picks

(3) The Shake-Up Meeting Makes Final Decisions On Allocation of Drivers to Each Division In Advance of The Pick

- Division managers and scheduling attend
- Evaluate if each division is to be at surplus or deficit when service is implemented, take action as appropriate

(4) Monthly Performance Reviews Jointly Evaluate Ideal Manpower Levels, Service Effectiveness And Efficiency, And Performance Against Budget

- Data base is identical to that used in other interim meetings, but is presented in summary fashion for the monthly review
- Performance data is reported for all activities to all MTC managers, along with an in-depth review of one area (e.g., changes or trends in the pay hour to platform hour ratio)
- Summary performance is reported to the Board and the Operations Committee of the Board

The data which support the manpower planning process originate from daily dispatching activities. The way in which this data is organized is described in the following section.

Description of MTC's Manpower Performance Reporting System

MTC relies upon a manual, integrated system of reports to track all the variables affecting operator availability. The consistency of this data base allows the sections which touch upon manpower planning -- transportation, scheduling and research -- to evaluate performance based upon a common view of reality. Six reports are utilized to describe operator availability on a daily, weekly and monthly basis. Each of these are briefly described below:

(1) The Daily Operating Report Serves As A Basic Data Source For All Reports Describing Operator Availability

A sample Daily Operating Report, compiled at the division level, is shown in Exhibit IV-7. This report is filled out for both the AM and PM

EXHIBIT IV - 7
DAILY OPERATING REPORT

FORM 73RA — DAILY OPERATING REPORT — AM ☐ PM ☒

DIVISION _____ DAY Tuesday DATE 2-8-83

PEAK SERVICE

	SCHEDULED	SCHEDULED & LOST	SCHEDULED & OPERATED	UNSCHEDULED & OPERATED	SPARES	TOTAL DIVISION SERVICE OPERATED
REGULAR SERVICE	~~124~~ 124	0	124	0	0	124
SPECIAL SERVICE						

OPERATE ANY OTHER DIVISION'S SCHEDULED AND OPERATED TRIPS DURING NON-PEAK PERIODS AND/OR PEAK HOURS? YES ☐ NO ☒

IF YES, COMPLETE THE FOLLOWING

WORK	DIRECTION ARTERIAL YES	DIRECTION ARTERIAL NO	REIGN BUS? YES	REIGN BUS? NO	DIVISION
	✓		✓		
	✓		✓		
	✓		✓		
	✓		✓		
	✓		✓		
	✓		✓		
	✓		✓		
	✓		✓		
	✓		✓		

REAR SCHEDULED SERVICE VARIATIONS

SERVICE DIVISION & SERVICE	REASON
10-599	
9-598	
RUN #	
1	#8502
PART TRIP	
LATE RUNS	
UNSCHEDULED REGULAR SERVICE OPERATED (NOT DEAD HEADS)	

LOST WORK (Use a new line each time any operator is relieved from duty)

TRIP	REASON
0	

LATE WORK

HR	REASON	# MIN
0		

UNSCHEDULED SERVICE OPERATED

TRIP	REASON
0	

SCHEDULED TRIPS NOT SERVICE OPERATED

# HR	WITHIN 1 HR YES	WITHIN 1 HR NO	2 OR MORE HRS YES	2 OR MORE HRS NO	FOR WHAT GARAGE?
0					

FORM 73RB — DAILY OPERATING REPORT — AM ☐ PM ☒

DIVISION _____ DATE Tues 2-8-83

BUSES

	ASSIGNED	SCHEDULED	OPERATED ON SCHEDULED SERVICE	OPERATED ON NON-SCHEDULED SERVICE	OPERATED TO GARAGES	OPERATED ON SCHEDULED REGULAR SERVICE	TOTAL DIVISION BUSES OPERATED	AVAILABLE NOT USED
STANDARD	156	~~124~~ 124	124	0	0	0	124	4
ARTICULATED								
DOUBLE DECKER								
OTHER (SPECIFY)								

DRIVERS

	TOTAL	REGULAR	PART TIME	PART TIME	SPECIAL SERVICE
ASSIGNED	197	130	55	12	—

	SCHEDULED	OPERATED SCHEDULED SERVICE	OPERATED NON-SCHEDULED SERVICE	OPERATED GARAGES	RELIEFS CLEANED & OPERATIONS ASSIGNED DIVISION SERVICE	TOTAL DIVISION DRIVERS WORKING	AVAILABLE NOT USED
DRIVERS	~~124~~ 124	124	0	0	0	124	0

OVERTIME DRIVERS

REGULAR	REGULAR N DAY OFF	EXTRABOARD	EXTRABOARD N DAY OFF	TOTAL
5	4	0	0	9

OTHER DRIVERS

PART TIME	MISC	STUDENTS
8	0	—

DRIVERS SCHEDULED OFF

REGULAR	15
EXTRABOARD-SCHED OFF	11
EXTRABOARD-ACTUAL OFF	6
PART TIME	1
SPECIAL SERVICE	—

DRIVERS OFF SCHEDULED DUTY

		FULL TIME		PART TIME
		DAY	EVNG	
A	SICK	6	5	1
	MISC — NOT WORKING REASON	0	1	0
	NO SHOW & MISSED REG (OT)	0 / 0	0 / 0	0
	MISSED UP	0	1	0
	Subtotal OFF	6	7	1
B	VACATION	6	3	
	ANNIVERSARY	0	0	
	JURY DUTY	0	0	
	Subtotal OFF	6	3	
C	ON LEAVE OF ABSENCE	1 / 0	0 / 0	2
	TRAINERS	0	0	
	STUDENT TRAINEE	0	0	
	OTHER	0	0	0
	TEMPORARILY OFF TO DDC	1	0	0
	PICKED	0	0	0
	HERE	0	0	0
	NOT READY DUTY	0	0	0
	NEED PLACED	0	0	0
	DAILY PLACEMENT	0	0	0
	Subtotal OFF	2	0	2
D	OTHER	—	—	—
	GRAND TOTAL DRIVERS OFF	14	10	3

RELIEF DRIVER

DRIVER NAME	DRIVER NUMBER	DATE & TIME	APPROVED	REMARKS

REVIEWED BY D.A. Kopf

periods, and addresses the following basic items of operator availability data:

- Amount of work performed
  - regular service
  - unscheduled service
  - foreign service (i.e., trips operated for another division)
  - lost service
  - late service
  - off peak service variations
- Drivers
  - total assigned to division
  - allocation of scheduled drivers working, including those not used
  - drivers working overtime
  - drivers scheduled off
  - drivers off scheduled duty
  - drivers lost to attrition

(2) <u>The Weekly Operations Summary Describes Current Manpower Levels, Attrition and Students In-Training</u>

- Compares actual full-time equivalent manpower levels to the ideal, by division
- Summarizes attrition to date, by division
- Summarizes students in training and expected turn-in date
- Describes service losses by day per division

(3) The Daily Operations Data Board Worksheet Is Used to Monitor The "Idealness" of Ideal Manpower Levels

This report also compares actual to ideal manpower levels and also reports the following descriptive statistics, by division:

- Daily statistics
  - absenteeism (percent and raw)
  - accidents
  - drivers assigned at overtime (percent and raw)
- Weekly statistics
  - payhour to platform hour ratio
  - unscheduled absences
  - lost trips

(4) The Monthly Operating Report Summary Tallies Operator Demand and Supply Information for Each Division

This report is a primary input to the ideal manpower calculation, and is summarized from the daily operating report. It provides the following information, by day:

- Service operated
  - regular
  - charter
  - extra
- Driver availability
  - number not available less than required (i.e., deficit in rspect to work)
  - foreign work

.. operated by the division
.. operated for the division

- lost trips

. Driver days-off and absenteeism

- scheduled off
- request off
- missed
- sick and workers comp
- miscellaneous

. Total overtime

(5) The Management Level Monthly Performance Report Provides Descriptive Indicators For Several Operator Availability-Related Variables

This report encompasses all areas of transportation and maintenance, and is transmitted to a number of MTC managers. Performance for the month is summarized at the system and division level. The wide distribution of this report makes performance a very visible commodity, and probably provides an informal incentive to improve performance. The operator availability-related indicators it reports are as follows:

. Driver levels

- in comparison to ideal
- number of part time drivers
- average daily percent of overtime drivers

. Payhour to platform hour ratio

- net (i.e., excluding paid leave and fringe)
- gross (i.e., all inclusive)

. Service reliability

- missed trips

- late pull-outs

- average daily incidents resulting in lost mileage

. Absenteeism

- scheduled
- on business
- on leave
- held off
- late/no-show

. Attrition

(6) The Chairman's Monthly Performance Report Provides Graphical Trend Data For The Current and Past Fiscal Year

This report is distributed to the chairman and members of the Operations Committee, and contains an abstraction of data distributed through the management-level report. It contains the following information related to manpower availability:

. Average daily missed trips

. Average daily late pull-outs

. Payhour to platform hour ratio, actual compared to budget

. Actual versus ideal manpower

- full time
- part time

. Driver absenteeism

* * * * *

MTC's use of the Ideal manpower planning process provided two important benefits. First, it provided a structure by which several departments could interact in managing operators

availability. Second it became a means by which performance could be monitored -- a benchmark. The Ideal process became an established tool because it was effective for planning purposes, was flexible so as not to constrain operational considerations and included a feedback mechanism which described resulting effectiveness.

V. CAPITAL DISTRICT TRANSPORTATION AUTHORITY CASE STUDY

This chapter describes the procedures employed by the Capital District Transportation Authority (CDTA) in managing operator availability. The procedures, which have been refined over the last several years, are embodied in a series of policies and activities which cut across functional lines of the organization. The dominant feature of CDTA's operator availability management is controlled decision-making, relying heavily upon performance achievement in respect to a plan.

Typical of many medium-sized properties today, maintaining the balance between operator supply and demand at CDTA is less critical than in previous years because current economic conditions have not been conducive to service growth. Such service stabilization has reduced hiring requirements to replacement of those operators lost through attrition. This situation, of course, was not always true at CDTA.

CDTA was created in 1970, and todayserves nearly 12 million bus riders in Albany, Schenectady, and Troy annually at an operating cost of approximately $13 million. It currently employs 258 bus operators who drive about 5.3 million miles of scheduled service per year. These bus operators are represented in the collective bargaining process with the Authority by two divisions of the Amalgamated Transit Union -- Local 1321 in Albany and Troy, and Local 1283 in Schenectady.

Like many transit agencies who transitioned service from private ownership to public operations in the 1970s, CDTA modified and expanded the service according to the financial resources it could garner through federal, state, and local support. During its formative years, CDTA Board Members and their special committees were deeply involved in the operational functions on the agency, including service level changes, hirings, procurements, and salary review decisions. As the Authority continued to grow, Board Members continued to have substantial involvement in the daily operations, even as additional and competent staff in planning, finance, and public information were brought on-board. As a result, the lack of distinction between executive and staff responsibilities constrained the flexibility often required in operations decision-making.

The remainder of this chapter describes the evolution of CDTA's existing approach to operators availability management, then documents the activities which it encompasses.

Evolution of CDTA's Present Approach to Managing Operator Availability

Recognizing the problems introduced above, CDTA conducted a management improvement study in 1978-1979 in selected areas and functions of the organization. Among the study's topics were several procedures impacting operator availability management procedures:

- Separation of policy and operating functions;
- Personnel planning;
- Service change and innovation;
- Automated data processing;
- Scheduling; and
- Biddable tripper/extra list mix.

The study findings confirmed much of what was already known or suspected by CDTA. Options for change were described and recommendations were made that offered direction for operational improvement.

In light of increasing expenditures and the impending cessation of federal operating assistance, the CDTA retained the present Executive Director and together took actions that would improve organizational performance. Coupled with the functions of budgeting, service scheduling, and dispatching, CDTA now utilizes four procedural activities to manage their operator work force availability. These activities are both interactive and communicative.

(1) Objectives Are Established At Each Operating Division In Support Of Authority Goals

At the beginning of each year, the Executive Director requests each department head to establish measurable objectives that are supportive of CDTA's goal and overall mission, as shown in Exhibit V-1. The goals established by the Executive Director are similar each year because they are, by design, of a continuing nature. However, emphasis may be placed on different areas each year because of the previous year's performance. In 1983, emphasis was placed on:

- Loss control, particularly in all aspects of safety;
- Productivity (i.e., improve output per unit of input);
- Performance measurement (i.e., improve monitoring and measurement procedures); and
- Training (i.e., improve the skills of all employees).

EXHIBIT V-1
CAPITAL DISTRICT TRANSPORTATION AUTHORITY
1983 OPERATING GOALS

1.	Productivity	To maximize the effective economic use of available resources, particularly human effort
2.	Economy	To provide public transportation that is economical to use and at the lowest feasible level of public support
3.	Safety	To provide public transportation that is increasingly safe
4.	Effectiveness	To provide quality public transportation that is available and dependable
5.	Responsiveness	To provide public transportation that is responsive to public needs
6.	Public Policy	To foster an improved public policy toward public transportation
7.	Management	To develop and maintain a desire for excellence at all levels of the organization

(2) An Attendance Control Program Was Established To Reduce Absenteeism

The Attendance Control Program has been successful in reducing operator-lost days (i.e., days lost in transportation) between September 1980 and February 1983 by approximately 43 percent. Exhibit V-2 shows the favorable trend achieved at CDTA through implementation of the program. While maintenance absenteeism has increased over the three-year time period, transportation absences show a marked decrease.

The thrust of this program is based on attentive, day-to-day review of each operator's absence record. Reviews of performance are made each day by Division Superintendents and the Transportation Manager with corrective actions taken, as necessary, for excessive absence frequency and/or duration. Monthly records are prepared by the Transportation Manager for review by the Executive Director. The Job Status Committee, consisting of the Executive Director, the Transportation and Maintenance Managers, the Director of Personnel, and the Coordinator for Employee Relations meet monthly to review each absence-problem employee and determine appropriate actions to be taken in each case.

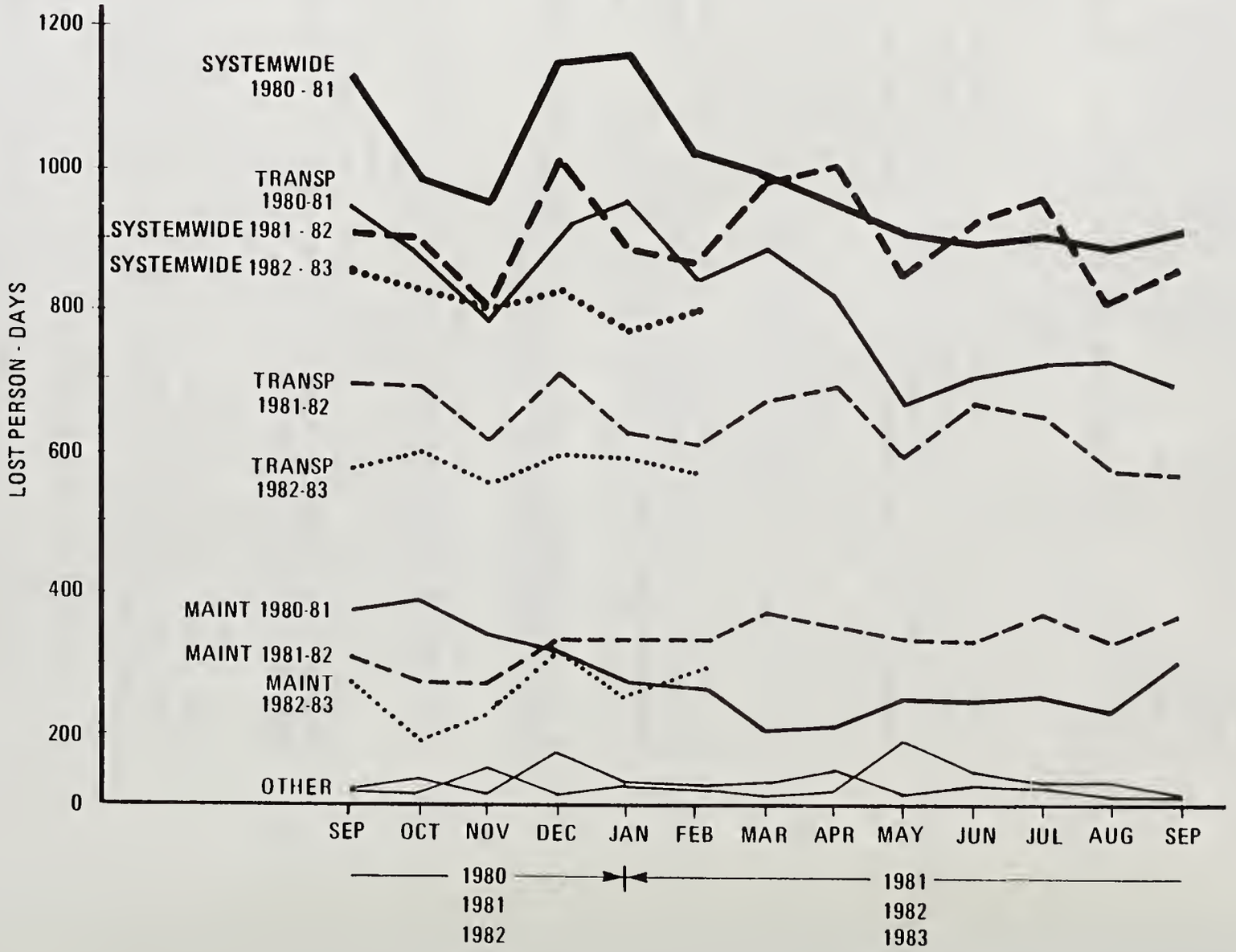
(3) A Monthly Reporting of Operator Needs Is Required From Each Operating Division

Division superintendents provide monthly projections of manpower needs indicating whether they expect a surplus or deficiency in personnel in the upcoming month. These reports are consolidated and evaluated monthly by the Transportation Manager and quarter-annually by the Executive Director.

Decisions made that affect the operator availability process are not totally based on division superintendent estimates, but rather on a combination of factors that also include:

- Absenteeism trends;
- Service cuts that occurred as a result of operator unavailability;
- Public comments and complaints.

EXHIBIT V-2
THREE YEAR TREND IN LOST TIME AT CDTA



- Unscheduled costs and, in particular, unscheduled overtime; and

- Future changes in service policies.

(4) All Service Change Requests Must Be Evaluated By The Staff Services Committee

All service change or modification requests that are received by CDTA are analyzed and evaluated by the Staff Services Committee. This committee recommends actions to a Special Services Committee composed of CDTA Board members. The Special Services Committee may require additional analyses by the staff committee or recommend to the Board that the change or modification be implemented on a trial basis.

Most non-fare service changes will require an analysis of operator requirements through the runcutting process, unless such changes are so minor that they can be accommodated within the capacity of the present operator work force. Types of service changes which may require work force-size analyses and which may affect the balance of supply and demand of operators include:

- Scheduled service frequency;
- Route location;
- Bus running and layover times;
- Vehicle operating speeds;
- Establish/eliminate route services; and
- Establish special services.

Operator Availability Management Process

The operator availability management process may be defined by basic procedures that occur in six areas of activity. These areas include:

- Management-by-objectives;
- Budgeting;

- Service evaluation;
- Attendance controls;
- Operator requirements; and
- Scheduling and dispatching.

The interrelationships of these activities are shown in Exhibit V-3. They are described through two dimensions -- activity responsibilities and activity frequency -- in the sections that follow .

(1) The MBO System Serves To Focus Management's Attention On Problem Areas of Operator Performance and Productivity

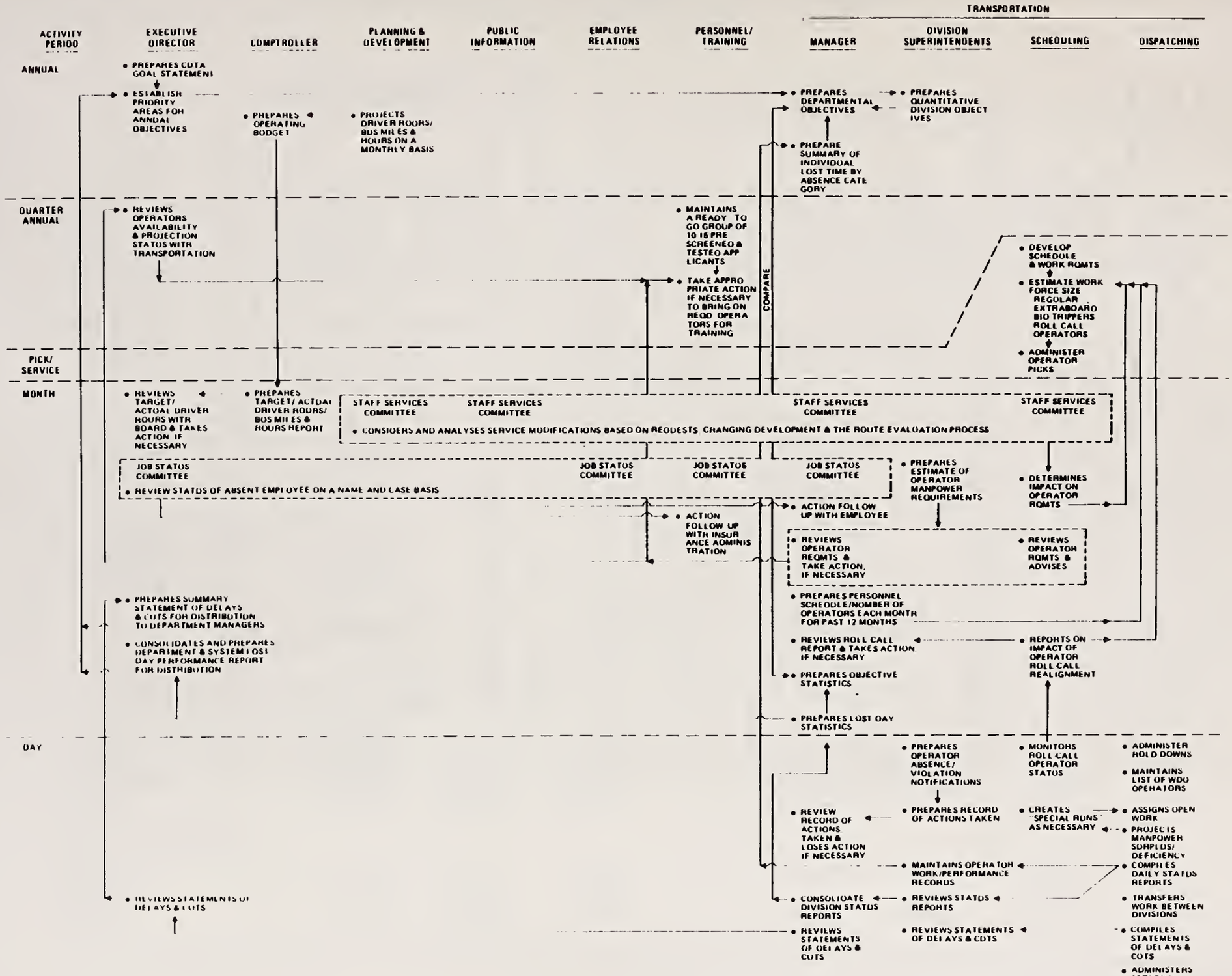
While the goals of the CDTA are broad and continuing, the Executive Director provides overall direction to Department Managers in December of each year by identifying areas in need of improvement. During the following month, the Transportation staff meets several times to develop objectives, first by operating division and then collectively by department. The previous year's objectives are reviewed together with their results.

This year, the CDTA Transportation Department established two principal, related objectives:

- Reduce operating costs in selected areas, namely:
  - reduce operator lost time; and
  - reduce passenger accidents.
- Improve the quality of line service through improved reliability and efficiency.

The objective of reducing operator lost time included setting performance targets for reducing sickness, on-the-job injuries, and misses by percent over the previous year. Lowering lost work days effectively reduces the requirements for extraboard operators to fill the open work

EXHIBIT V-3
CDTA OPERATOR AVAILABILITY MANAGEMENT PROCESS



resulting from absences. Improving the quality of line service may be evaluated, in part, by the number of cut runs and trips which affect headway and service reliability. This objective places renewed effort to have no cuts due to operator unavailability. The achievement of improved performance, as described by these examples, will impact the process of maintaining balance in the number of available operators and productive work.

(2) The Operator Budget Is Prepared By The Comptroller Based on Monthly Pay Hour Projections

Each year, the Comptroller prepares an operating budget for adoption by the Authority's Board of Directors. The operator labor cost component of the budget is targeted on a monthly basis using straight time and overtime projections developed by the Planning and Development Department. These projections are based on planned service and the number of expected platform hours that are incurred by schedule type. Platform hours by schedule type are received from the Transportation Department's scheduling function. The platform hours are summarized on a monthly basis and factored to produce driver straight time and overtime hours. The current factors that have been developed are:

- Straight pay hours = 1.06 * Platform hours

- Overtime pay hours = 0.17 * Platform hours

Each month, the Comptroller produces a Key Target Report, as shown in Exhibit V-4, that compares the differences in actual versus targeted (or budgeted) operating statistics. This monthly report is reviewed by the Executive Director and the Board. Once every six months, staff makes a formal presentation of the cumulative results and receives comments and direction regarding actions that should be taken to reverse or retard adverse situations.

The effect of these procedures on operator availability management is directly related to the Board's actions. For example, the Board may

EXHIBIT V – 4
CAPITAL DISTRICT TRANSPORTATION AUTHORITY
KEY TARGET REPORT

MONTH OF JANUARY, 1983

	THIS MONTH			YEAR-TO-DATE			
	ACTUAL	TARGET	DIFFERENCE	ACTUAL	TARGET	DIFFERENCE	%
PERATING REVENUE	663939	578027	85912	6231918	5831954	399964	6.86
PERATING COST	1323296	1310104	13192	12958731	13300388	-341657	-2.57
IDERSHIP	1247452	1109993	137459	11777104	11145963	631141	5.66
UEL USE	126707	120727	5980	1221643	1232613	-10970	-0.89
RIVERS' HOURS							
STRAIGHT TIME	43444			442929			
OVERTIME	7356			76200			
TOTAL	50800	51536	-736	519129	525169	-6040	-1.15
ECHANICS' HOURS							
STRAIGHT TIME	14005			148342			
OVERTIME	843			8719			
TOTAL	14848	15352	-504	157061	158504	-1443	-0.91
ILES OF SERVICE							
ROUTE	527448	519335	8113	5251506	5298941	-47435	-0.90
CHARTER	378	4170	-3792	37575	41700	-4125	-9.89
TOTAL	527826	523505	4321	5289081	5340641	-51560	-0.97
OURS OF SERVICE							
ROUTE	40943	41481	-538	412192	422796	-10604	-2.51
CHARTER	51	417	-366	3157	4170	-1013	-24.29
TOTAL	40994	41898	-904	415349	426966	-11617	-2.72

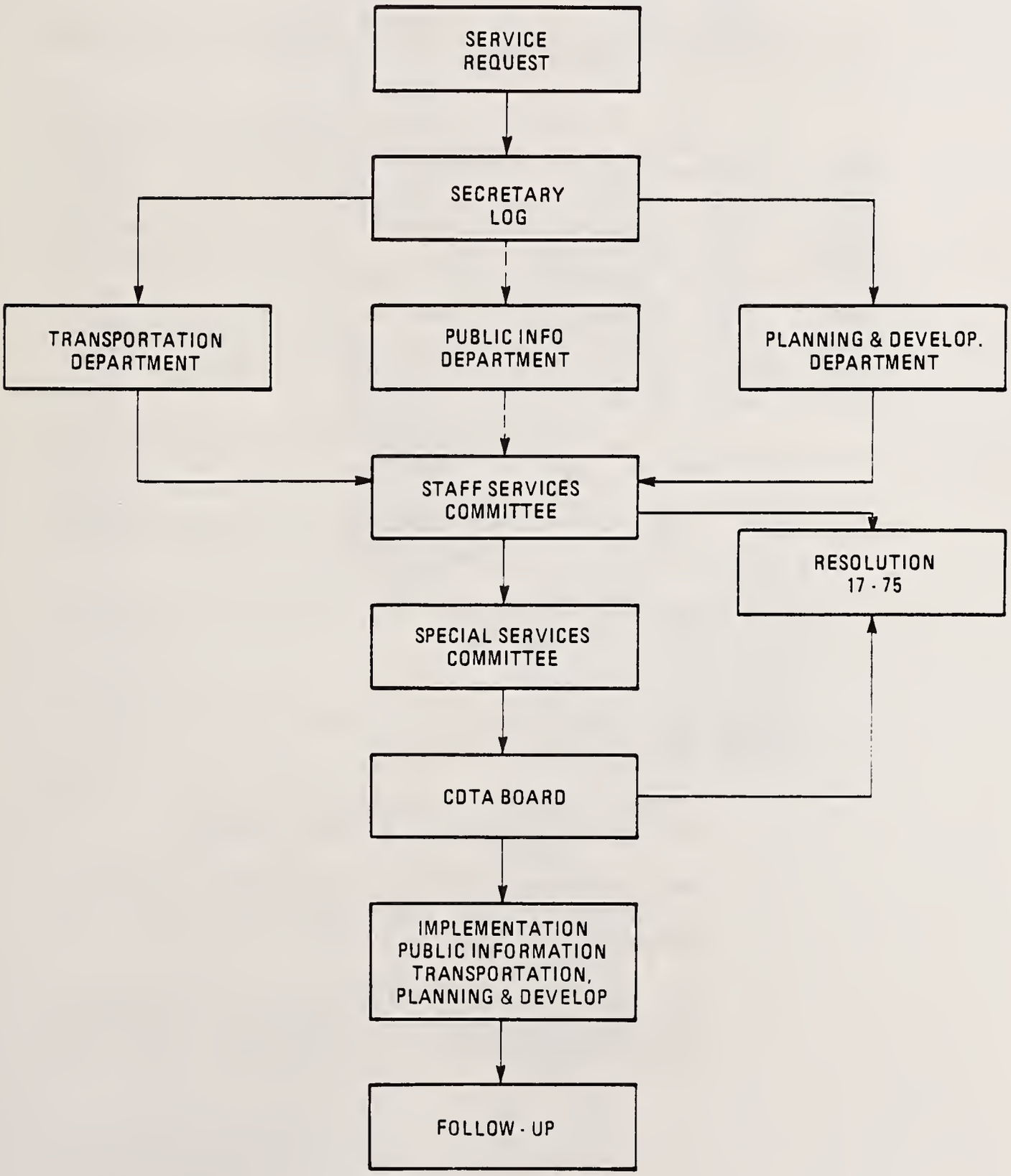
desire to reduce the growth rate of driver overtime hours. Such action may require staff to find another way to accomplish the overtime work that could include the hiring of additional operators and/or reducing absenteeism. The reduction of absences increases the available hours of operators for productive work.

(3) The Staff Services Committee Evaluates The Change In Operator Requirements Due To Potential Change Or Modification In Service

Once every four to six weeks, the Staff Services Committee meets to consider and analyze all service change and modification requests. The requests may be initiated by the public, members of the Board, elected officials, or by the CDTA staff itself. Staff requests, for example, may emanate from the Transportation Departments and include problems encountered in operations such as passenger overloads or traffic congestion. They may also result from CDTA's Route Evaluation Process which is managed by the Planning and Development Department. This process uses daily passenger counts on each route taken from operator's records together with cost and operating statistics to produce measures and indicators that allow rank ordering of route service performance. Based on the analysis of information, the committee can make recommendations to the Executive Director and the Board for their actions. This process is shown in Exhibit V-5.

The impact of any decision to revise the service plan directly affects the scheduling function. Since one member of the Staff Services Committee is the Supervisor of Schedules, his responsibility is to assess the impact of requested service revisions on the scheduled runcuts as well as the requirements for operators. The cost of changing services (as well as the benefits) are analyzed with the Committee's recommendation presented to a Special Services Committee of the Board who takes further action regarding the service change request. Although the question of operator availability may not

EXHIBIT V – 5
CDTA SERVICE REQUEST
FLOW CHART



always be explicitly addressed by the Board in minor service changes, the Supervisor of Schedules does determine the change in operator requirements through the runcutting process. CDTA is currently in the process of retaining outside assistance to install an automated runcutting mechanism to speed-up the process and assist the Authority to make more informed decisions.

(4) The Attendance Control Program Regulates The Need for Additional Operators

The CDTA Attendance Control Program impacts the management of operator availability through its effectiveness in reducing absenteeism. Since the level of service has remained stable during the past few years, the reduction of absences has acted to fill the gap left by normal attrition of operators by requiring less operators to fill the open work. Exhibit V-6 provides a graphic display of the processes used in the program, beginning with the collection of basic absence information on a daily basis.

. Dispatching provides the basic information for the process

  - Absences are reported in a Daily Status Report, as shown in Exhibit V-7.

  - Absence data are collected by individual and type.

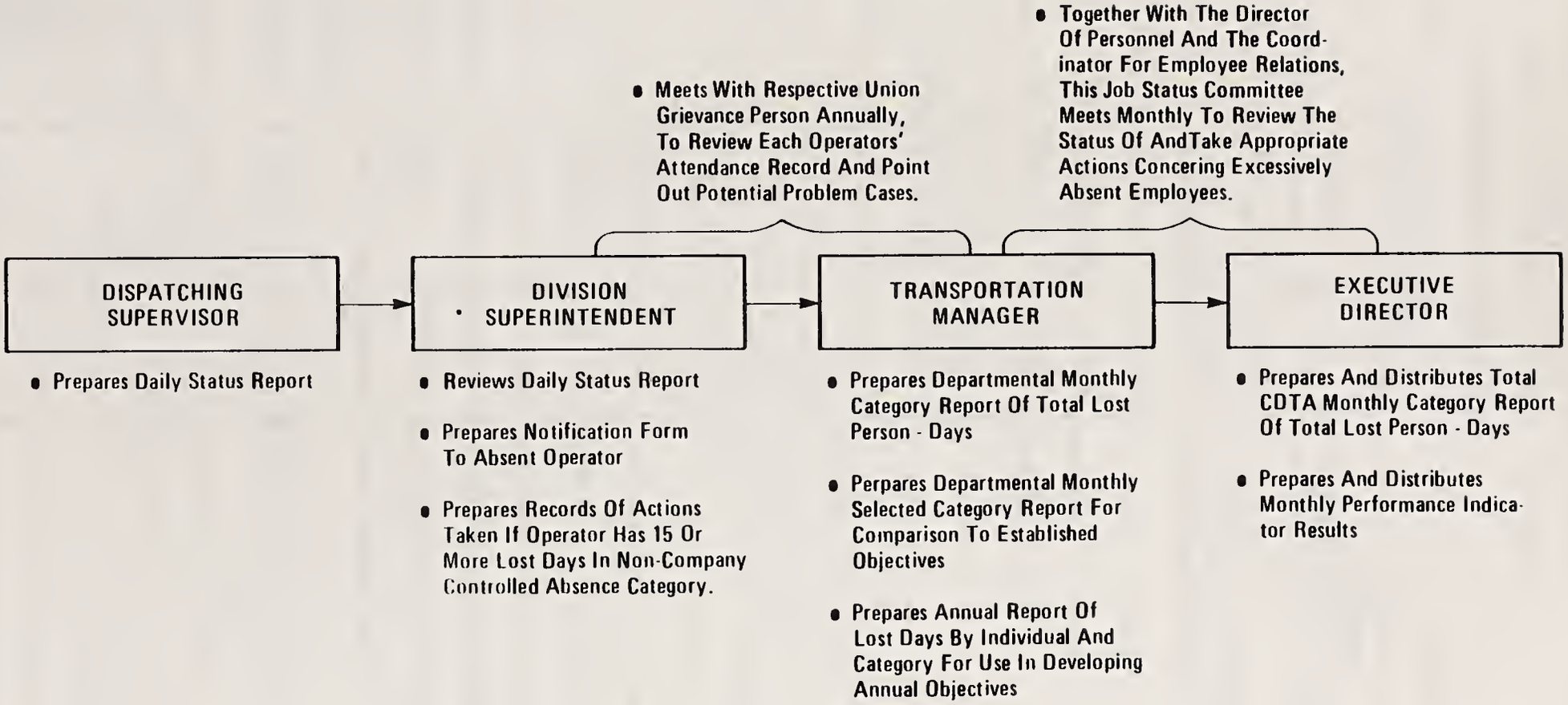
. Division Superintendents issue written notifications to each absentee .

  - Daily report information is entered into each operator's work record.

  - Notification forms, as shown in Exhibit V-8, issued to operators on the occasion of each absence.

  - If operator has lost 15 or more days due to non-company-controlled absence, corrective action is taken by the

EXHIBIT V – 6
ATTENDANCE CONTROL PROGRAM PROCESS



TD-32

EXHIBIT V – 7
CAPITAL DISTRICT TRANSPORTATION AUTHORITY
Transportation Department

DAILY STATUS REPORT

DAY FRIDAY DATE 3-25-83

CREW	OPERATOR LAST	FIRST	ID	DAYS OFF	CODE	LAST DAY WORKED	Time Off	Date Off	DATE OK
14-C			9878	SUN-SAT	A-13	1-13-83	1-14-83		
9A W/T			7054	SUN-SAT	A-1	1-31-83	1-31-83		
913			3498	SUN-THU	A-10	2-22-83	2-26-83		3-28-83
30B W/T			7249	SUN-SAT	A-13	3-4-83	3-4-83		3-28-83
33-C			8525	SUN-SAT	A-1	3-17-83	3-17-83		
916			7351	WED-THU	A-13	3-18-83	3-19-83		
15-A			7326	SUN-SAT	A-13	3-18-83	3-21-83		3-28-83
4-A			8448	SUN-SAT	A-13	3-23-83	3-24-83		
10B W/T			6912	SUN-SAT	A-18	3-24-83	3-25-83		
18C W/T			6864	SUN-SAT	A-13	3-24-83	3-25-83		
99H			1683	SUN SAT X	A 4Y 20 22	3-25-83	3-25-83		
T954			8932	SUN SAT X	A 9	3-25-83	3-25-83		
8-C			9526	SUN-SAT X	A-20 8	3-25-83	3-25-83		3-28-83 *

TD-5
(REV 4-1-82)

EXHIBIT V – 8
CAPITAL DISTRICT TRANSPORTATION AUTHORITY
Transportation Department

NOTIFICATION FORM

NAME: _____ ID NO. _____ DATE OF OCCURRENCE _____

DIVISION: _____

This form is intended to notify you of an absence or a violation of Company Rules and Regulations, or that a hearing has been scheduled. This Notification is not discipline.

ATTENDANCE

☐ Absence (Extension of Days Off) ☐ Absence (Miss)

VIOLATION OF RULES/REGULATIONS

☐ Failed to display ID
☐ Uniform
☐ Ahead of Schedule
☐ Smoking
☐ Radio Procedures
☐ Off Route Operation
☐ Destination Signs
☐ Other

REMARKS: _____

_____

_____

☐ FIRST NOTIFICATION ☐ SECOND NOTIFICATION ☐ THIRD NOTIFICATION

☐ Your absence has been noted. ☐ The violation has been noted.

☐ You are advised to take corrective action and improve your record in respect to the above.

☐ You are notified that a hearing has been scheduled at the office of

_____ on (day) _____, (date) _____

at (time) _____, for the following reason: _____

SIGNED: _____ DATE: _____

Dist.: Original - Operator
Copy - ATU Rep
Copy - File

Division Superintendent with a Record of Actions Taken, as shown in Exhibit V-9. Such actions may include:

.. Informal counseling
.. Verbal warning
.. Written warning
.. Suspension
.. Termination

. Monthly absence reports serve as a means for tracking performance objectives

- Departmental lost-day summaries are prepared each month by operating division and type, as shown in Exhibit V-10.

- Selected categories of absence summaries are prepared, as shown in Exhibit V-11, by operating divisions as comparative reminders of the objectives first established in January.

- Annual summaries by individual and absence type are prepared by the Transportation Manager which serve as a guide in the establishment of annual objectives. These are also reviewed with the Union representative to identify problem situations.

. A Job Status Committee focuses on the identification and disposition of special absence cases

. Special problem absences such as extended illness due to disability or compensable injury are carefully handled by the Transportation Manager in coordination with the Executive Director, the Coordinator for Employee Relations, and the Director of Personnel through the Job Status Committee. This committee reviews each special problem on a case-by-case basis with appropriate action follow-ups by the Transportation Manager and/or the Personnel Director. Such follow-ups with employees may include:

EXHIBIT V – 9
CAPITAL DISTRICT TRANSPORTATION AUTHORITY
Transportation Department

RECORD OF ACTIONS TAKEN
Absences/Violations

NAME: _____ ID NO. _____ SEN. DATE: _____

DIVISION: _____ DATE ACTION TAKEN: _____

Action has been taken as a result of:

☐ MISS ☐ ABSENCE (Extension of Days Off) ☐ ABSENCE (Overall poor record)

☐ PREVENTABLE ACCIDENT(s) ☐ VIOLATION OF RULES/REGULATIONS

☐ OTHER (Explain under "Remarks")

Type of Action Taken:

TD-5 Issued: ☐ YES ☐ NO ☐ FIRST ☐ SECOND ☐ THIRD

Hearing Held: ☐ YES ☐ NO If Hearing held; Union present? ☐ YES ☐ NO

Date of Hearing: _____

Individual received: ☐ COUNSELING ☐ VERBAL WARNING ☐ RE-TRAINING

☐ DISCIPLINARY LETTER ☐ SUSPENSION (No. of days _____)

☐ FINAL WRITTEN WARNING BEFORE TERMINATION

REMARKS: (Provide all facts relative to the above) _____

_____

_____

_____

Signed: _____ DATE: _____

Dist: Original - Manager of Transportation
Copy - Coordinator of Employee Relations
Copy - Division File
Copy - Operator's File

EXHIBIT V – 10

TO: Administrative Assistant (B. Voss)

FROM: TRANSPORTATION Department MONTH: FEBRUARY 1983

TOTAL LOST PERSON-DAYS FOR MONTH WERE AS FOLLOWS:

CATEGORY		ALBANY	SCHEN.	TROY	TOTAL
Excused Absences					
A-4	Excused	7	4	10	21
A-7	Family Death	4	-	--	4
A-17	Birthday	8	1	--	9
A-18	Personal Day	19	9	10	38
Unexcused Absences					
A-5	Miss, failed to report	5	4	6	15
A-8	Family sickness	--	--	--	--
A-9	Family emergency	2	1	2	5
A-12	Refused suitable work	--	--	--	--
A-13	Sickness, not yet eligible for disability benefits	51	15	13	79
A-15	Transportation/unable to report	6	3	2	11
A-19	Late and did not work all day	--	---	--	--
A-22	Unexcused absence	--	3	--	3
Disability					
A-2		57	40	52	149
Compensation					
A-1		59	40	33	132
Suspension					
B		6	3	--	9
TOTALS		224	123	128	475

RV

Signature of Department Head

Revised 6-82

EXHIBIT V – 11
CAPITAL DISTRICT TRANSPORTATION AUTHORITY
Transportation Department

M E M O R A N D U M

TO: Manager of Transportation

FROM: Assistant to Manager of Transportation

DATE: March 4, 1983

RE: Systemwide Attendance Comparison
February 1 - 28, 1983

SELECTED CATEGORIES

	Feb. 1982				Feb. 1983				+ %-
	A	S	T	SYS	A	S	T	SYS	SYS
Single Sick Days	49	17	36	102	51	15	13	79	- 23
Miss	5	8	7	20	5	4	6	15	- 25
Compensation	28	37	--	65	59	40	33	132	+103

OVERALL STATISTICS

DIVISION	Feb. 1982 Total Days	Feb. 1983 Total Days	+ %-
Albany	238	224	- 6
Schenectady	141	123	- 13
Troy	129	128	- 1
System	508	475	- 6

- Weekly communications;

- Physical examinations;

- Interview immediately upon return to work; and

- Counseling and/or warning letters.

. Perfect attendance is recognized by top management

The Director of Personnel issues a report to the Executive Director of employees who achieved perfect attendance for the prior year. The Executive Director, in turn, sends a personal congratulatory letter to the employee's home, has posted a notice of congratulations to the employee in all work areas, and institutes the featuring of these employees in the company newsletter.

The CDTA Attendance Control Program has been quite effective in reducing absenteeism, as demonstrated in Exhibit V-12. This absence reduction over the past three years has played a major role in reducing operator requirements. The number of operators required in February 1983 was 18 less than the previous year for essentially the same level of service.

(5) The Estimation Of Operator Requirements Lends Structure To Monthly Manpower Planning

Division superintendents prepare a monthly report of operator manpower requirements for the succeeding month. This estimate is compared to the existing work force size and is found by determining each of the following:

. The number of regular and relief operators needed to cover the upcoming scheduled runs;

. The number of vacation floaters needed to cover upcoming peak vacations;

EXHIBIT V – 12
CAPITAL DISTRICT TRANSPORTATION AUTHORITY
Capital District Transportation System
Capital District Transportation System No. 1
Capital District Transportation System No. 2

OPERATING RESULTS

PERFORMANCE INDICATOR: Attendance

PERIOD COVERED: February, 1983

FIGURES ARE: Person-Days Lost to Absence

	ALBANY DIVISION	TROY DIVISION	SCHENECTADY DIVISION	TOTAL
TRANSPORTATION DEPARTMENT	224	128	123	475
MAINTENANCE DEPARTMENT	126	45	24	195
ALL OTHER DEPARTMENTS	32	0	0	32
TOTAL	382	173	147	702

NOTES: Compare these results to past performance:

	Feb. 1981	Feb. 1982	Feb. 1983
Transportation Dept.	741	502	475
Maintenance Dept.	165	230	195
All Others	19	23	32
Total:	925	761	702

Overall, we are about 7.8% better than last year. We still have room for improvement, however. This represents about 23 lost days per employee per year!

- The number of extraboard operators needed to cover operators who may wish to take days off as personal leave in lieu of available sick leave (a contract provision);

- The number of extraboard operators to cover miscellaneous absences such as misses and illnesses;

- The number of extraboard operators needed to cover peak tripper requirements; and

- The number of extraboard operators needed to cover extraboard days-off.

A consolidation of these reports is prepared by the Transportation Manager and, together with the Supervisor of Schedules, evaluates the net surplus or deficiency of operators. The estimates do not explicitly project or estimate unexpected separations of operators (i.e., attrition losses). Appropriate actions are taken, if necessary, to hire, transfer, or lay-off operators accordingly. Operators may be laid-off by CDTA for lack of work, but retain the right of first recall to fill vacancies.

At least once quarter-annually, the Executive Director reviews the status of operator requirements with the Transportation Manager to determine what actions need to be taken, if any, to optimize operator availability. In the course of the review, consideration is given to the issues of absenteeism trends, future service modifications, runs and trips that were previously cut due to the unavailability of operators, and public complaints received at the CDTA. The appropriate level of operators is finally determined by the Executive Director who considers all of the above factors plus the amount of unscheduled overtime pay that is being experienced.

CDTA's manpower planning process, coupled with the Attendance Control Program, has resulted in a 6.5 percent reduction of the operator work force during the last year, while service levels have remained nearly constant.

(6) The Scheduling and Dispatching Functions Provide the Needed Flexibility to Balance Operator Supply and Demand

The most active functions at CDTA in terms of managing operator availability are scheduling and dispatching. These functions can exert significant influence on the efficiencies of transit operator performance and productivity within the broader parameters (e.g., manpower levels) already established. Their respective activities are summarized below..

. Scheduling translates the scope of transit services into work force assignments through the runcutting process.

- Picks (i.e., driver selections of work) are held three times per year -- in January, June, and September.

- Total operator requirements may be varied by Scheduling in respect to available manpower, by increasing or decreasing the number of biddable overtime trippers.

.. There are no restrictions on the number of bids which may be posted for pick.

.. Those trippers which are not posted for bid by regular operators are left open to be chosen by or assigned to the extraboard on a daily basis.

.. This flexibility tends to act as a balancing mechanism during periods of operator shortages.

- In the event of operator surpluses, "special runs" may be created to keep operators productively employed. Such runs, paying eight hours, may be created for short-term bids (i.e., hold-downs) through combinations of trip assignments, janitorial duties,

charters, service crew assignments (assigning buses to operators), distributing schedules, and performing vault truck operations. In the event of driver shortages, the Schenectady Division labor agreement permits supervisors and dispatchers to fill-in for operational assignments.

. Dispatching addresses the daily management of operator availability, and is the responsibility of the dispatcher whose job it is to see that all runs are filled and work is covered. In discharging this responsibility, the following activities are performed:

- Communicating with other divisions to determine shortage or availability of operators. Work may be transferred to other divisions in the event of operator shortages.

- Administering hold-down and personnel leave procedures.

  .. hold-downs for vacations are posted and selected at the three regular pick times.

  .. vacation hold-down positions not selected are worked from the extraboard

  .. vacation hold-down operators, known as slated extra men, revert to the extra list when they are not needed (e.g., during uneven vacation schedules)

  .. Runs which are expected to be open for seven consecutive days or longer may be posted for hold-down on a weekly basis. The slate for such hold-downs are closed on Fridays at 4:30 p.m. prior to the week in which they take effect.

- Preparing Statement of Delays and Cuts, as shown in Exhibit V-13, and transmitting it through the Transportation Manager to the Executive Director, where it is summarized on a monthly basis for systemwide distribution.

- Maintaining a list of available operators who have indicated their desire to work on scheduled days off -- minimum guarantee for work day-off operators, provided they are called in to work is two hours of work at either regular or overtime rates, whichever shall apply.

The dispatcher is aided by labor agreement provisions which enable flexibility in the event that operators are unavailable to staff charters, trippers, and service crew work. Qualified garage and shop employees, for instance, may operate vehicles in revenue service so long as such operation does not interfere with their regular work schedule. Payment for such work is at the top operator's wage rate and all overtime is paid at time and one-half. Operators do not have the authority to pass such work to garage or shop employees.

Additionally, the dispatcher retains some flexibility in sequencing the report times of extra operators. This enables him to alter the match between operator supply and demand throughout the day. The efficiency with which this is accomplished affects the amount of non-productive time paid. At CDTA, this time includes unscheduled guarantee pay (i.e., time to make-up a 40-hour week) and unscheduled spread premium (i.e., time paid after being held in excess of 11 hours).

All extra operators are required to report up to three times daily between the hours of 4:00 a.m. and 6:00 p.m., as determined by CDTA. If extra operators make all required reports but receive no work assignments, they are guaranteed six hours of pay in an 11-hour period following their first report time. They are also guaranteed a 40-pay hour week, assuming they have

EXHIBIT V – 13

CAPITAL DISTRICT TRANSPORTATION AUTHORITY

Transportation Department

STATEMENT OF DELAYS

DIVISION: ALBANY DATE: FRI., MARCH 18, 1983

LINE	BUS NO.	LOCATION	OPERATOR	REASON FOR DELAY	DELAY	MIN. SERVICE
8-03	481	Swan/Liv.	St. Jean	involved in accident	12:57-1:10P	13 min.

BUS CHANGES: CODE C

2-60	446 to 471	no radio
14-03	320 to 435	failed Silent Alarm test
15-01	513 to 507	broken latch on engine compartment door

CAPACITY LOAD: CODE B

10-01-491 Westbound at Lark & Washington at 4:32 pm.

TOTALS

No. bus changes	3
No. min. delay	13
Full trips cut	0
Half trips cut	.0

RECEIVED

BY _____

MAR 21 1983

MGR. – TRANS.
C D T A

TOTAL _____

DENNIS P. DEE, MGR. OF TRANSPORTATION

cc: Executive Director
Mgr. Maintenance
Public Relations
Supv. Schedules
Maint. Specialist

made all reports and completed work as assigned. All hours worked by extra operators after the 11-hour period following their first report are paid at the rate of time and one-half.

To guard against the unscheduled guarantee and spread, the Scheduling Supervisor monitors the daily distribution of absences. During the past year, he has realigned the reporting times of extra operators to more closely match the occurrence of open work. A memorandum, as shown in Exhibit V-14, provided the basis for this realignment of the reporting times of the extra operators. A monthly report, as shown in Exhibit V-15, is issued by the Supervisor of Schedules which reports the differences between current results and those of the same period in the previous year.

EXHIBIT V – 14
CAPITAL DISTRICT TRANSPORTATION AUTHORITY
Transportation Department

M E M O R A N D U M

TO: MANAGER OF TRANSPORTATION

FROM: SUPERVISOR-SCHEDULES ak

DATE: OCTOBER 1, 1982

RE: MAY 23, 1982 REALIGNMENT OF A.M. ROLL CALL REPORTS

I recommended in a Memorandum dated March 19, 1982 the following changes be made in the A.M. roll call report times for the extra men for the May 1982 pick of runs.

ROLL CALL REPORTS PRIOR TO MAY 1982		ROLL CALL REPORTS EFFECTIVE MAY 1982	
4:00 AM Report	- 1 Operator	4:00 AM Report	- 1 Operator
4:30 AM Report	- 2 Operators	4:40 AM Report	- 1 Operator
5:30 AM Roll Call	- 13 Operators	5:30 AM Roll Call	- 3 Operators
		6:15 AM Roll Call	- 6 Operators
6:45 AM Roll Call	- Balance	6:45 AM Roll Call	- Balance

I have made a comparison of September 1981 and September 1982 starting the week of Labor Day when our summer vacation ended. This time provides for a good period of analysis because of the large number of roll call operators available, in comparison to the summer months when there are very few roll call operators.

SEPTEMBER 1981

Number of days in the test period	17
Number of roll call operators	262
Spread time overtime hours	492.75
Average spread hours per day	29.98
Average spread hours per operator	1.88

SEPTEMBER 1982

Number of days in the test period	18
Number of roll call operators	283
Spread time overtime hours	272.00
Average spread hours per day	15.11
Average spread hours per operator	0.96

EXHIBIT V – 15
CAPITAL DISTRICT TRANSPORTATION AUTHORITY

Month	Weekdays Per Month	Roll Call Operators Per Month	Average Roll Call Operators Per Day	Spread Time Overtime Hours Per Month	Average Spread Time Overtime Hours Per Day	Average Spread Time Overtime Hours Per Day Per Operator
February 1982	20	385	19	572.75	28.6	1.48
February 1983	20	213	10	303.00	15.1	1.42
Comparison	0	-172	- 9	-269.75	-13.5	- .06

VI. SUMMARY AND RECOMMENDATIONS

The previous three chapters have presented different systems by which operator availability can effectively be managed. The virtue of these systems is their simplicity. Each establishes broad parameters at a high (or strategic) level in the organization, within which short-term (or tactical) decisions and corrections are made. Even though each system accomplished this in a different manner, there were several important points of commonality:

- A plan of action existed which was accepted by each participant in the process;
- Procedures were developed and accountability was identified to control organizational interfaces; and
- A means existed to report and evaluate progress against the plan.

These three principles should be a part of any transit system's approach to operator availability management. In the case studies just described, the value of the management process was much more evident than the application of any technique. This is a valid conclusion and should hold in any case. A contributing reason to the lack of innovative techniques, however, is the fact that they are conceptually complex and not presently or readily available.

As regards UMTA's role in pursuing greater management productivity, there are several automated tools and techniques which could be of value to operator availability management.

Generally, these tools either improve management's predictive ability, or automate time-consuming activities. These are briefly described in the balance of this chapter.

Recommendations for Further Study

The opportunity to apply automated tools to operator availability management has been greatly increased by the affordability and capability of microcomputers and their peripheral equipment. The recommendations which follow are designed to take advantage of these capabilities and to productively support decision-making as regards operator availability. They are divided into three groups -- predictive models, optimization techniques, and data base systems.

1. A Predictive Model Should Be Developed To Link The Budgeting Process With Management Of The Manpower Inventory

A tool of this nature could be central to developing an annual manpower plan and would simultaneously accomplish several objectives. First, it should describe the cost impacts of any parameters, including seasonal ones, affecting the manpower inventory (e.g., service levels, attrition) or cost rates. Thus, it supports a more programmatic approach to budgeting. Second, it should be capable of at least roughing out a hiring schedule. Third, it should be capable of determining the timing and extent of layoffs, where required, and accurately estimating the cost of such actions, or their postponement.

Ideally, the model would run on a daily or weekly basis to capture the level of detail required to simulate an operational environment. Additionally, it could be expanded to model individual facilities in a multi-divisional setting.

2. Optimization Techniques Are Applicable Only To Issues In Extraboard Assignment

In assigning the extraboard, a dispatcher must relate a fixed supply to a demand set which is highly variable in nature. In almost all cases, assignments are made by informed judgement. The opportunity for mathematical improvement over such an assignment may or may not be large. It could, however, improve the dispatcher's productivity and certainly would not increase cost.

There are several situations where optimization techniques are applicable:

- Minimizing cost of tripper assignments;
- Developing day-off combinations to maximize certain desirable days off; and
- Developing assignment times for the report crew.

3. Data Base Systems Could Be Developed To Maintain Real-Time Absence Status And Thus Increase Predictability

The primary reason why unscheduled extraboard costs are incurred is due to the unpredictability of manpower availability. There are, however, many categories of lost time that should be known well in advance of their occurrence. Their visibility is mainly a function of good recordkeeping -- vacations, personal holidays, long-term illnesses, and so

forth represent lost time whose status only needs to be modified on an exception basis. A system could be developed to capture all these data, providing not only good information on absences to support other analyses, but also could serve as a front-end to payroll and could potentially support an automated extraboard assignment.

APPENDIX
DOCUMENTATION OF AUTOMATED TECHNIQUES

Three automated techniques utilized by Seattle Metro are briefly described in this appendix. While their development was based on Metro's unique needs, they are potentially of use to other transit systems as well. The three techniques include:

- Day-Off Combination Model
- Manpower Planning Model
- Least-Cost Tripper Assignment Model

Each of these are briefly described below.

1. The Day-Off Combinations Model Computes Consecutive Day-Off Combinations In Response To Daily Driver Demand

A consecutive days-off constraint greatly increases the complexity of determining how many operators can be off work on a given day. The program utilized by Metro was originally developed for calculating extraboard days-off. It has since been modified and is used for establishing days-off solution sets for driver bids.

The output from this interactive program is shown in Exhibit A-1. Execution is as follows:

(1) User enters daily demand.

(2) Initial results are displayed. Note that non-integer values are calculated when weekly driver demand is not a multiple of five.

EXHIBIT A-1
OUTPUT FROM
DAY OFF COMBINATIONS MODEL

```
manpowr
22:47:09 C:MANPOWR .COM


input manpower needed for each day
 mo tu wd th fr sa su
 20 20 20 20 20 15 17

manpower used for each day          drivers days off are:
  mo tu wd th fr sa su    sa-su su-mo mo-tu tu-wd wd-th th-fr fr-sa total

 20 20 20 20 20 15 17      7.2   2.2   4.2   2.2   4.2   2.2   4.2    26.4
do you want all combinations of vacant runs (y=1,n=2)1

how many vacant runs do you want ?2

manpower used for each day          drivers days off are:
  mo tu wd th fr sa su    sa-su su-mo mo-tu tu-wd wd-th th-fr fr-sa total

 18 20 20 20 20 15 17      6.0   3.0   5.0   1.0   5.0   1.0   5.0    26.0
 19 19 20 20 20 15 17      7.0   2.0   5.0   2.0   4.0   2.0   4.0    26.0
 19 20 19 20 20 15 17      6.0   3.0   4.0   2.0   5.0   1.0   5.0    26.0
 19 20 20 19 20 15 17      7.0   2.0   5.0   1.0   5.0   2.0   4.0    26.0
 19 20 20 20 19 15 17      6.0   3.0   4.0   2.0   4.0   2.0   5.0    26.0
 19 20 20 20 20 14 17      7.0   2.0   5.0   1.0   5.0   1.0   5.0    26.0
 19 20 20 20 20 15 16      7.0   3.0   4.0   2.0   4.0   2.0   4.0    26.0
 20 18 20 20 20 15 17      8.0   1.0   5.0   3.0   3.0   3.0   3.0    26.0
 20 19 19 20 20 15 17      7.0   2.0   4.0   3.0   4.0   2.0   4.0    26.0
 20 19 20 19 20 15 17      8.0   1.0   5.0   2.0   4.0   3.0   3.0    26.0
 20 19 20 20 19 15 17      7.0   2.0   4.0   3.0   3.0   3.0   4.0    26.0
 20 19 20 20 20 14 17      8.0   1.0   5.0   2.0   4.0   2.0   4.0    26.0
 20 19 20 20 20 15 16      8.0   2.0   4.0   3.0   3.0   3.0   3.0    26.0
 20 20 18 20 20 15 17      6.0   3.0   3.0   3.0   5.0   1.0   5.0    26.0
 20 20 19 19 20 15 17      7.0   2.0   4.0   2.0   5.0   2.0   4.0    26.0
 20 20 19 20 19 15 17      6.0   3.0   3.0   3.0   4.0   2.0   5.0    26.0
 20 20 19 20 20 14 17      7.0   2.0   4.0   2.0   5.0   1.0   5.0    26.0
 20 20 19 20 20 15 16      7.0   3.0   3.0   3.0   4.0   2.0   4.0    26.0
 20 20 20 18 20 15 17      8.0   1.0   5.0   1.0   5.0   3.0   3.0    26.0
 20 20 20 19 19 15 17      7.0   2.0   4.0   2.0   4.0   3.0   4.0    26.0
 20 20 20 19 20 14 17      8.0   1.0   5.0   1.0   5.0   2.0   4.0    26.0
 20 20 20 19 20 15 16      8.0   2.0   4.0   2.0   4.0   3.0   3.0    26.0
 20 20 20 20 18 15 17      6.0   3.0   3.0   3.0   3.0   3.0   5.0    26.0
 20 20 20 20 19 14 17      7.0   2.0   4.0   2.0   4.0   2.0   5.0    26.0
 20 20 20 20 19 15 16      7.0   3.0   3.0   3.0   3.0   3.0   4.0    26.0
 20 20 20 20 20 13 17      8.0   1.0   5.0   1.0   5.0   1.0   5.0    26.0
 20 20 20 20 20 14 16      8.0   2.0   4.0   2.0   4.0   2.0   4.0    26.0
 20 20 20 20 20 15 15      8.0   3.0   3.0   3.0   3.0   3.0   3.0    26.0


input manpower needed for each day
 mo tu wd th fr sa su
```

(3) User indicates whether all vacant run combinations (i.e., the two consecutive days that the weekly driver is off) should be included in calculations. If answer is affirmative, the program will alter daily demand to accommodate every possible combination of the number of vacant runs (consecutive days-off combinations) specified.

(4) User enters vacant run assumptions. In the example's case, two vacant runs are entered to achieve a weekly multiple of five runs. Any number of vacant runs, however, could be entered. Valid results in any case can be achieved only if weekly driver demand is a multiple of five.

(5) The model provides day-off combinations for each permutation of daily demand and vacant run assumptions.

The model employs a matrix reduction technique to achieve its results. The seven-by-seven matrix uses seven day-off combinations set equal to each day's demand. It currently operates on an Altos microcomputer (discussed more completely in the following paragraphs), and was developed by Jim Keller of the Computer Services Division.

2. The Manpower Planning Model Computes Weekly Hiring Needs In Response To Availability And Demand Variables

This model estimates weekly manpower variances and hiring needs based on the following variables:

- Annual absence rates
  - Industrial injury
  - Personal holiday
  - Detailed to other duties
  - Sick leave
  - Military leave
  - Other leave
- Annual attrition rates
- Tolerance for manpower deficit before hiring

- Training class attrition
- Class size
- Training period in weeks
- Starting driver population and drivers in training
- Weekly operator vacation levels
- Weekly scheduled and unscheduled work estimates

Examples of the model's output are given in Exhibits A-2 and A-3. Manpower variance and hiring calculations are based on weekday work. The model is not, as presently configured, sensitive to seasonal absence rates. Two versions were developed -- one is written in FORTRAN and designed to run on an IBM mainframe; a similar model was written in APPLE BASIC. No documentation is currently available. Both versions replicate methodology developed by Dan Graczyk, Manager of Base Operations, and the APPLE version was written by Clarke Isackson, also of Base Operations.

3. The Tripper Cost Minimization Model Uses An Assignment Algorithm To Calculate Least-Cost Tripper Combinations

Tripper assignment is a daily problem at many transit systems. A number of pieces of work exist which can be combined to form extraboard assignments. A prototype model developed by Metro, to be implemented next year within the Base Operations System (BOSS), examines all open trippers to establish least-cost extraboard assignments (exclusive of open full-time runs). The assignment algorithm sees each possible tripper combination as a cell in the matrix. A cost is assigned to each cell based on total pay minutes. The assignment algorithm selects one cell from each row (or column) in

EXHIBIT A-2
WEEKLY MANPOWER SUMMARY
MANPOWER PLANNING MODEL

PERIOD	102		109		116		123		130		206		213		220		227	
WORK	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT
RUNS & COMBOS		683		683		683		683		683		683		693		683		683
TRIPPERS	862	36	862	36	862	36	862	36	862	36	862	36	862	36	862	36	862	36
EXTRAS & LEASES	0		0		0		0		0		0		0		0		0	
REPORTS		52		52		52		52		52		52		52		52		52
TOTAL WORK	862	771	862	771	862	771	862	771	862	771	862	771	862	771	862	771	862	771
NUMBER OF OPERATORS																		
START	791	1167	786	1164	781	1161	776	1158	771	1155	766	1152	761	1149	756	1146	772	1143
ATTRITION	5	3	5	3	5	3	5	3	5	3	5	3	5	3	5	3	5	3
QUALIFIED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	15	0
BALANCE	786	1164	781	1161	776	1158	771	1155	766	1152	761	1149	756	1146	772	1143	782	1140
ABSENCES																		
INDUSTRIAL		16		16		16		16		16		16		16		16		16
VACATIONS		72		60		60		49		60		51		57		66		70
HOLIDAY		3		3		3		3		3		3		3		3		3
DETAILED		27		27		27		27		27		27		27		27		27
SICK	16	44	16	44	16	44	16	44	16	44	16	44	15	43	15	43	16	43
MILITARY		3		3		3		3		3		3		3		3		3
EXCUSED	7	32	7	32	7	32	7	32	7	32	7	32	7	32	7	32	7	32
RDO		175		174		174		173		173		172		172		171		171
OTHER	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
TOTAL	23	373	23	360	23	360	23	348	23	359	23	349	22	354	22	356	23	366
** NUMBER AVAILABLE	763	791	758	801	753	798	748	807	743	793	738	800	734	792	750	787	759	774
** BALANCE	-99	20	-104	30	-109	27	-114	36	-119	22	-124	29	-128	21	-112	16	-103	3
** OT TRIPPERS		40		40		40		40		40		40		40		40		40
***** VARIANCE	-99	60	-104	70	-109	67	-114	76	-119	62	-124	69	-128	61	-112	56	-103	43
FULL-TIME EQUIV VAR		10		19		12		19		2		7		-3		0		-8

EXHIBIT A-3
HIRING SCHEDULE OUTPUT
FROM MANPOWER PLANNING MODEL

***** HIRING SCHEDULE *****

PERIOD	0		0		0		0		102		109		116		123		130		206		213	
	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT
HIRE AS FOLLOWS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	21	0	7	0

PERIOD	220		227		306		313		320		327		403		410		417		424		501	
	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT
HIRE AS FOLLOWS	41	0	0	0	0	0	27	0	0	0	35	0	21	0	21	0	21	0	21	0	21	14

PERIOD	508		515		522		529		605		612		619		626		703		710		717	
	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT
HIRE AS FOLLOWS	0	0	0	8	24	0	0	8	0	0	21	8	0	0	0	0	0	0	0	0	0	0

the matrix. It was developed from an article in the Association of Computing Machinery, entitled "An Extension of the Munkres Algorithm for the Assignment Problem." Jim Keller of Metro's Computer Services Division was responsible for adapting the algorithm to Metro's use.

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NOTICE

DOT-I-84-23

DOT-I-84-23

TECHNOLOGY SHARING

A PROGRAM OF THE U.S. DEPARTMENT OF TRANSPORTATION